AD NUMBER: AD0903899
LIMITATION CHANGES
TO: Approved for public release; distribution is unlimited.
FROM: Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation Use; 01 Oct 1972 Other requests shall be referred to Department of the Army, Washington, DC 20310.
AUTHORITY
DAMA ltr dtd 13 May 1975

THIS REPORT HAS BEEN DELIMITED
AND CLEARED FOR PUBLIC RELEASE
UNDER DOD DIRECTIVE 5200.20 AND
NO RESTRICTIONS ARE IMPOSED UPON
ITS USE AND DISCLOSURE.

DISTRIBUTION STATEMENT A

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED.

AD903899

PREPARED FOR THE
DEPARTMENT OF THE ARMY
Contract DAHC19-69-C-0017

DISTRIBUTION STATEMENT
Distribution limited to U.S. Government agencies only; Test and Evaluation; 4 Aug 72. Other requests for this document must be referred to HQDA(DARD-ARG-S), Washington, D.C. 20310.

DRAFT IN LIEU
OF FINAL
RAC-D12-CR

OCTOBER 1972

CARMONETTE IV and CARMONETTE V

by Norman W. Parsons

DRAFT

Copy 14 of 40

RAC Research Analysis Corporation

GAMING AND SIMULATIONS DEPARTMENT DRAFT IN LIEU OF FINAL RAC-D12-CR Published October 1972

CARMONETTE IV and CARMONETTE V

by

Norman W. Parsons

DRAFT

Research Analysis Corporation RAC

McLean, Virginia 22101

Area Code 703
893-5900

Published October 1972
by
RESEARCH ANALYSIS CORPORATION
McLean, Virginia 22101

FOREWORD

Letter DARD-ARG-S, 8 Aug 72 from the Office of the Chief of Research and Development, Department of the Army states in part:

> "A gap exists in the documentation available to the Army concerning the CARMONETTE model. The latest complete documentation was the three volume RAC-R-28 that covers CARMONETTE III. These volumes were published in the period October 1967 through February 1968. Since that time, the model has been converted to the Control Data Corporation 6400 computer, and CARMONETTE IV and V have been developed. CARMONETTE IV and V were developed primarily for use in specific studies, and the documentation of these editions is contained only in those study reports. Since the reports are classified, and bulky, this is an undesirable situation for the Army analyst interested in the model only.
>
> There exists within RAC, an unclassified Coordination Draft dated 11 November 1971 that covers the changes to CARMONETTE III as a result of the computer change and the development of CARMONETTE IV and V. The Army desires that RAC publish and distribute that Coordination Draft so that the Army will have access to the most recent CARMONETTE documentation in an unclassified form. Recognizing that the Coordination Draft may not conform to RAC standards for technical publication, there is no objection to publishing it as a draft.
>
> Accordingly, you are authorized to publish and distribute document 'CARMONETTE IV and CARMONETTE V,' Coordination Draft, dated 11 November 1971."

This document is published in accordance with the above quoted letter.

LJ Dondero

L. J. DONDERO
Director
Gaming & Simulations Department

CONTENTS

INTRODUCTION

This document presents the changes that have been made in the CARMONETTE simulation since the publication of the CARMONETTE III documentation.

The details of the CARMONETTE III small unit battle simulations are documented in RAC R-28 (Vol I, Oct 67, AD 822400L; Vol II, Feb 68, AD 827900; Vol III, Jan 68, AD 825000).

In the period since the publication of the CARMONETTE III documentation, material changes have been made in the logic and details of the program. The program has been rewritten to convert it from the IBM 7040 computer, described in the CARMONETTE III documents, to the CDC 6400 computer. CARMONETTE IV is the version of the simulation resulting from the changes made to incorporate the employment of night vision devices. These changes were described in the report, "The Use of CARMONETTE IV in Assessing the Effectiveness of Small Units Equipped with Night Vision Devices," Draft, Nov 69, AD 514519L. CARMONETTE V is the version of the simulation resulting from the changes made for the Equal Cost Firepower Study (ECF-1) (Draft client report, Sept 71, undistributed).

This document includes the sections of the CARMONETTE IV report and the ECF-I report which discuss the details of the changes made to the CARMONETTE simulation since the publication of the CARMONETTE III documents. Minor changes have been made for the sake of coherence of this document.

THE CARMONETTE SIMULATION

GENERAL

CARMONETTE is a fully computerized Monte Carlo mathematical simulation of small unit ground combat. It is a time-sequenced critical-event war game that simulates the activities of movement, target acquisition, communications, and weapon employment by infantrymen and various vehicles, including tanks, armored personnel carriers, and helicopters, and a wide variety of weapons. Resolution can be at the level of the individual soldier or vehicle, or at squad or platoon level. Up to a reinforced-battalion-size force can be represented on each side.

CARMONETTE plays on a terrain simulation of 3780 grid squares (60 by 63).* The arrangement of the grid squares is fixed, but the grid size may range from 10 m to 250 m or larger depending on the size and type of units being simulated. Each grid square is described in terms of average elevation, available cover and concealment, cross-country and road trafficability, and height of vegetation.

CARMONETTE runs from a predetermined scenario and each unit is required to have explicit orders for its actions. Certain contingency type orders are available under which the actions of a unit will depend on its knowledge of and the actions of enemy or other friendly units. Battles as long as 60 to 90 minutes can be simulated.

---

*In CARMONETTE V. CARMONETTE IV was 36 by 63.

LOGIC CHANGES FOR CARMONETTE IV

General

In the development of CARMONETTE IV from CARMONETTE III several important changes and additions have been made in the logic of the simulation. A new type of unit, a Command, Control, and Surveillance Unit (CCSU), has been added. The previous Target Acquisition Routine has been separated into a Surveillance Routine and a Target Acquisition Routine. An entirely new routine, the Communications Routine has been added.

Command, Control, and Surveillance Units

The identification of the CCS units as being separate from the weapon units permits the play in the simulation of surveillance devices which are not weapon aiming devices. This type of device includes the hand-held thermal detector, the radars, and the night observation device. The CCS units conduct surveillance with their assigned devices; two different devices may be assigned to each unit, and when targets are detected, nearest square information is transferred to the weapon units subordinate to that CCS unit and also to its superior CCS unit by means of the Communication Routine.

A total of 27* CCS units can be established for each side. These are in addition to the 36* possible weapon units on each side. The limit of 63 total units is determined by the two digit octal mathematics that is used in the simulation. The CCS units are identified as units 37 through 63 even though less than 36 weapon units are played.

The CCS units are not assigned any weapons and thus do not participate in the exchange of fire. CCS units are not subject to detection and will be killed only when their last assigned subordinate unit is killed. A weapon unit must be identified as the "Buddy Unit" for each CCS unit. Separate movement orders are not prepared for the CCS units; instead each CCS unit accompanies his buddy and moves in accordance with

---

*In CARMONETTE V these numbers were changed to 15 CCS units and 48 weapon units.

that unit's orders. If the first assigned buddy unit should be killed, the CCS unit transfers itself to the next listed subordinate unit. If the CCS unit is not in the actual chain of command, i.e., the forward observers and the radar teams, one of the weapon units must still be assigned as the buddy unit. Dummy subordinate units may also be assigned to provide for continuity of action by the CCS unit if the first buddy unit is killed. A weapon unit may serve as the buddy unit for more than one CCS unit in which case they would all be assumed to move together.

In the night vision games the capability of calling artillery fires, an assignable capability to any CARMONETTE unit, has been restricted to CCS units on each side. On the Blue side only the CCS units identified as forward observers can call artillery. On the Red side the platoon leaders have this ability.

The CCS units do not enter the Target Acquisition Routine and the Position Disclosure Routine and thus are limited to acquiring detection, i.e., nearest square level of information.

The hierarchy of command established for the night vision games for the Blue side is shown in Fig. 1.

Surveillance Routine

The Surveillance Routine is the portion of the Battle Model in which target detections are determined. Figure 2 is a flow chart of the Surveillance Routine.

A surveillance cycle (also called scan time) is input for each sensor and this time determines the frequency at which a unit conducts surveillance with that sensor. In the night vision games this interval is 1 minute for all sensors except unaided eye which is 0.5 minute. When the surveillance clock for each sensor device becomes the lowest clock of the unit's list of ordered events, that unit's master clock is set for surveillance with that device. At the beginning of the game, the initial setting of all the surveillance clocks of all units is set to random times so that the units in the game will conduct surveillance at different times.

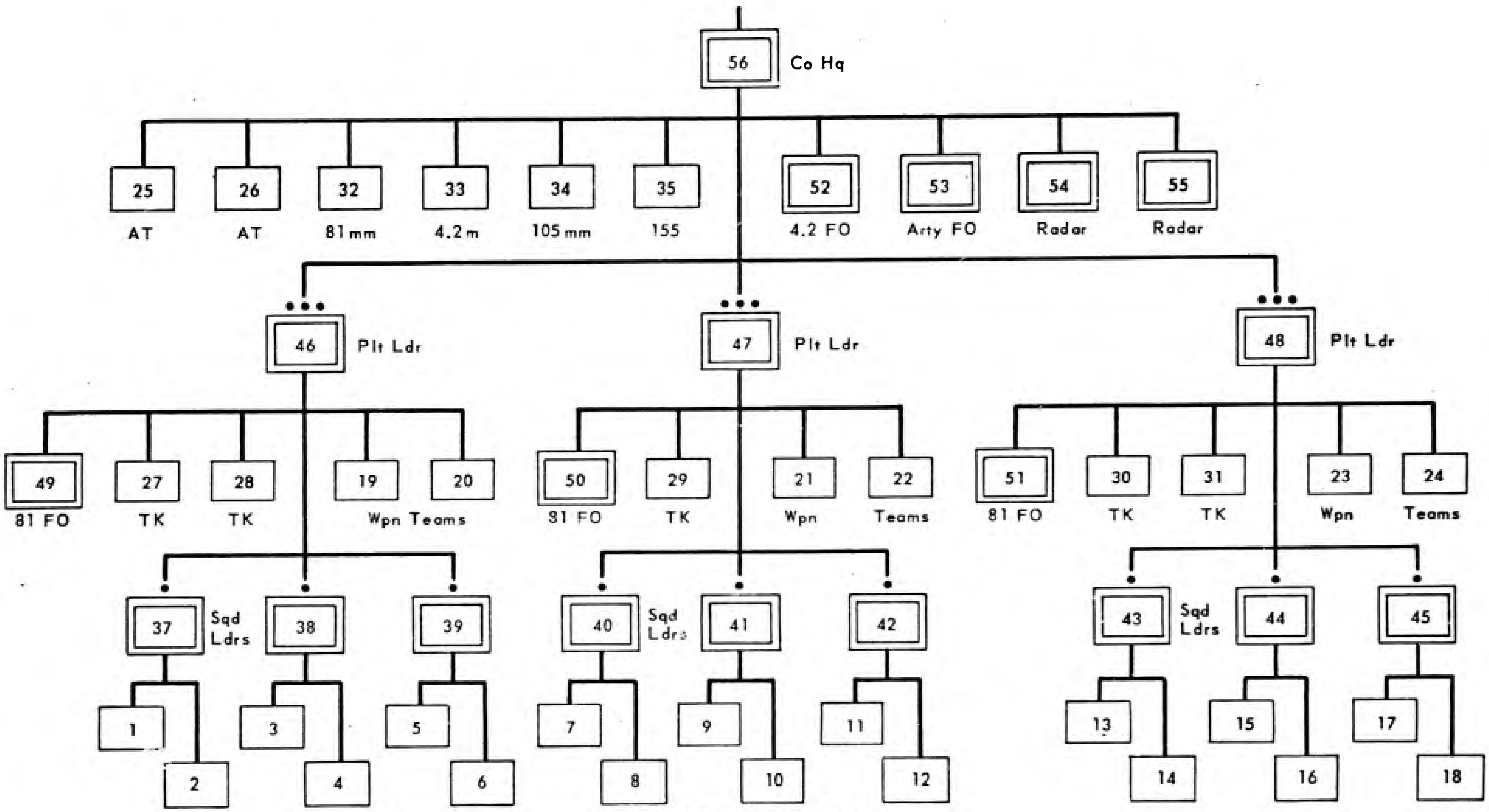

Fig. 1—BLUE Hierarchy of Command

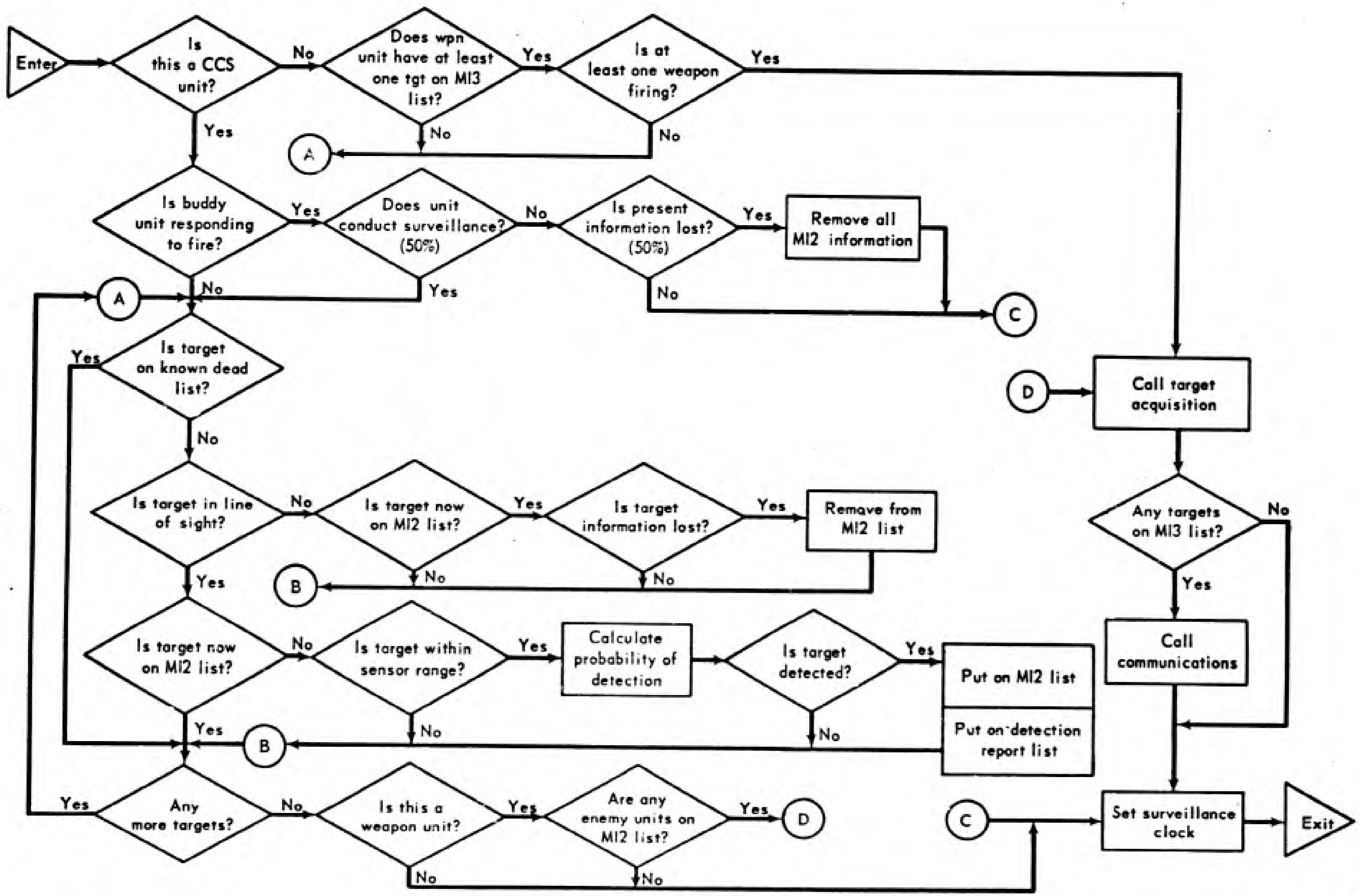

Fig. 2—Flow Chart—Surveillance Model

When a unit is conducting surveillance the computer processes each opposing unit for consideration of possible detection. If the target passes the following tests:

It is not on the known dead list
It is in line of sight
It is not already detected
It is within sensor range

a probability of detection is calculated as discussed in App A and a random number is drawn to determine whether or not a detection is made. (Note: as discussed in App A, a Computational Routine is not used for IR sensors (Class 3) and detections are determined for these sensors in the Target Acquisition Routine.)

If a weapon unit is already firing at a target when the weapon unit enters surveillance it does not conduct surveillance but goes directly to the Target Acquisition Routine where it randomly changes the information it already has.

A CCS unit that is in a grid square where enemy fire is of sufficient volume to neutralize the units there, has only a 0.5 probability of attempting surveillance. If surveillance is not attempted the unit has a 0.5 probability of losing any information it now has.

When all enemy units have been processed for a weapon unit, if any targets have been detected, the unit goes to the Target Acquisition Routine and randomly changes the information. Otherwise the unit surveillance clock is set for the next cycle as is done for CCS units.

Target Acquisition Routine

The Target Acquisition Routine is the portion of the Battle Model in which weapon units randomly change the information about detected targets. Figure 3 is a flow chart of the Target Acquisition Routine. A CCS unit that is assigned an IR sensor (Class 3) also uses the Target Acquisition Routine to determine target detections; however, higher states of information are not retained if the unit does acquire them.

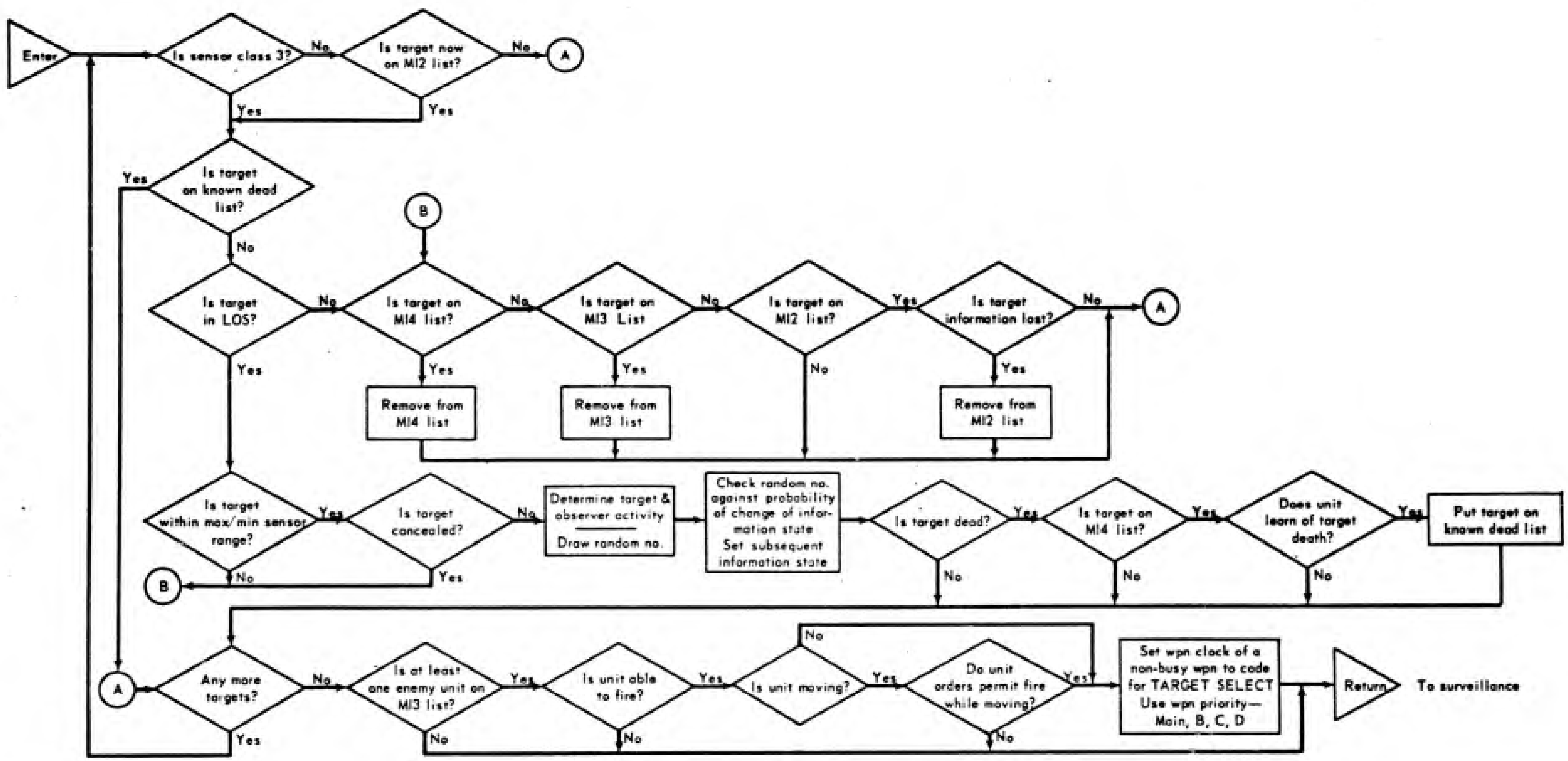

Fig. 3—Flow Chart—Target Acquisition Model

When a weapon unit enters the Target Acquisition Routine the computer again processes the complete list of enemy units; however, units that are not already detected (on the M12 list) are skipped. If the target unit passes the following tests:

It is not on the known dead list

It is in line of sight

It is within sensor range

It is not concealed

a random number is drawn and compared with the probabilities in the change of information matrix (discussed in App A) to determine the subsequent level of information.

If a target is dead, but not previously known to be dead, and accurate information (pinpoint) is acquired about it, there is a probability that the target death will be learned.

It is possible for a target to be on the detected (or a higher level) list when it is not in line of sight. This occurs when a previously detected target (or the detecting unit) moves so that line of sight no longer exists and may occur when a unit is given information through the Communication Model. When this situation exists the information will be degraded one state each surveillance cycle until only detection information is known, then there is a 0.5 probability that this information will be lost.

When the Target Acquisition Routine is completed for all enemy units, if a weapon unit has acquired at least erroneous pinpoint information (M13 list) on one target, and the unit is able to fire, the unit will go to the Target Select Routine and assign one of its weapon groups to fire at the target. The unit then returns to surveillance and if information has been acquired in target acquisition the unit goes to the Communications Routine to transmit this information.

Communications Routine

The Communications Routine permits all units to exchange target information. Figure 4 is a flow chart of the Communications Routine.

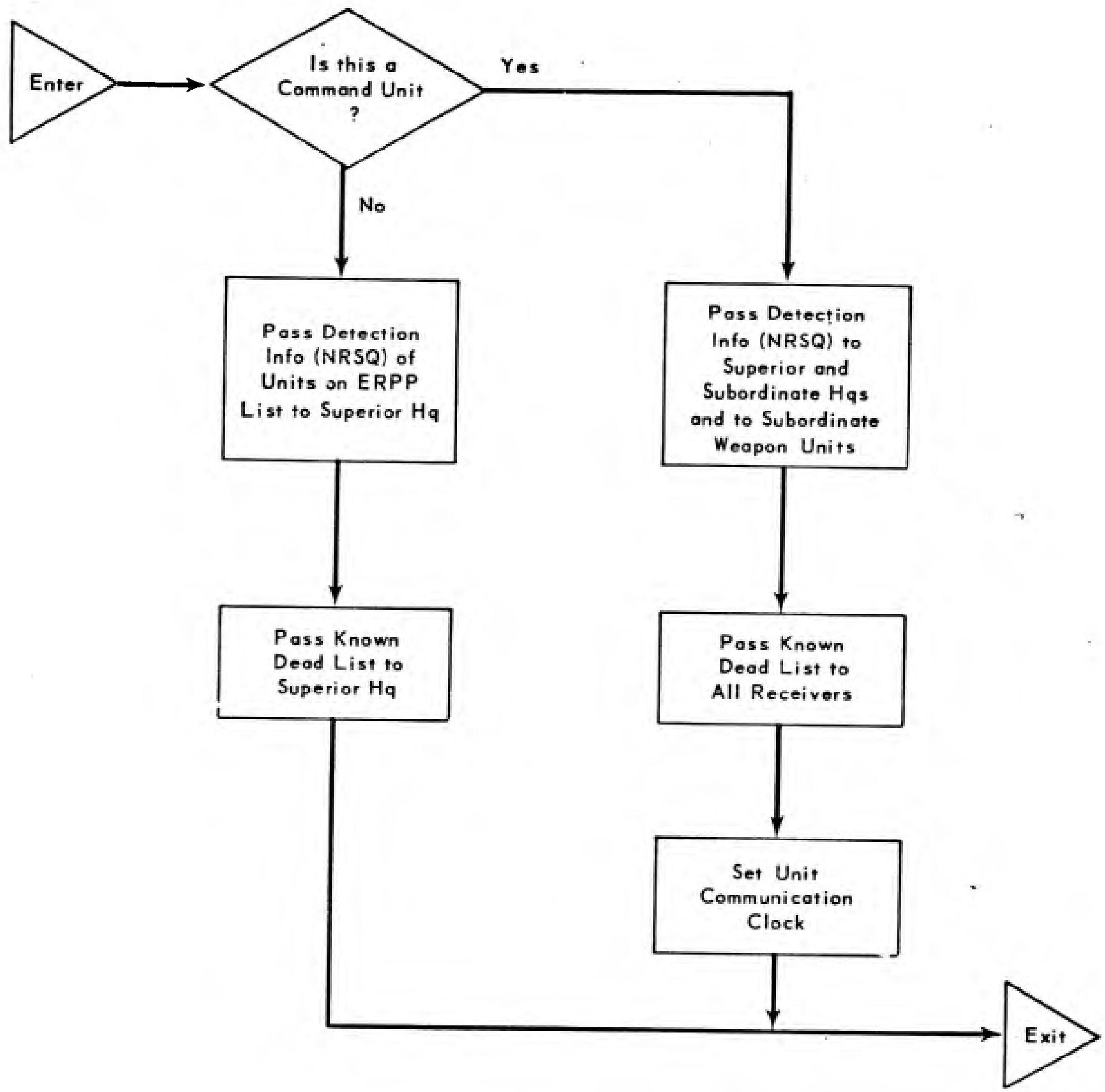

Fig. 4—Flow Chart—Communications Routine

When a weapon unit acquires information higher than detection (M13 or M14 lists) in the Target Acquisition Routine it transfers detection information on these targets and also the known dead information to its superior CCS unit. A communications cycle, currently 1 minute, is established for the CCS units. At the end of the communication cycle each CCS unit transfers to its immediate subordinate weapon and CCS units and to its superior CCS unit (See Fig. 1) whatever detection (nearest square) and known dead information it has.

CARMONETTE V

CARMONETTE V is an expansion and revision of the CARMONETTE III[1] and CARMONETTE IV[2] versions of the simulation. This document will discuss the changes that were made to produce CARMONETTE V. Readers who are not familiar with the earlier versions of CARMONETTE are referred to the appropriate documentation.

Map Size

The size of the map of the playing area has been expanded to 60 by 63 grids from the previous size of 36 by 63 grids.

Number of Units

The number of weapon units on each side that can be played has been increased from 36 to 48. The number of command and control units that can be played is reduced from 27 to 15 to keep the total number at 63, the limit of the two digit actual number space allocation. The first identified command unit must be number 49 regardless of the number of weapon units being played.

Remount Routine

Earlier versions of CARMONETTE included a Dismount Routine in which a mechanized infantry unit could be given orders to dismount from their carrier(s) and fight on foot. The carriers could then be given orders to move to a different location.

To permit the play of delaying tactics that was desired in the ECF runs, a Remount Routine for the APC transported infantry was included in the program. By using this routine the infantry can be placed on their initial defensive position and at an appropriate time in the game they will remount and move to a second (and third) position to continue the battle.

Helicopter Model

The helicopter model which had been available in the IBM 7040 version of CARMONETTE III was recreated and expanded. The helicopter model can simulate the actions of attack helicopters, reconnaissance helicopters and troop transport helicopters.

The Attack Helicopter Routine has been modeled to simulate the "pop-up" tactics currently (1971) regarded as the most desirable against a sophisticated enemy.

Vehicle Kills by Artillery

The Artillery Assessment Routine in earlier versions of CARMONETTE assessed the effects of artillery fires only against dismounted infantry. In CARMONETTE V the Artillery Routine has been expanded to include the assessment of the effect of DP/ICM munitions against vehicles.

Range of Engagement Summary

A new Postprocessor Routine has been created which extracts and assembles information from the battle history tape. This routine presents a summary of all engagements (firing actions), vehicles killed, and troops killed, by each type of weapon against each target class for each 100 m range bracket in the particular game concerned.

Details of Changes

These new routines for CARMONETTE V are discussed in more detail in Appendix B.

The revision of the input forms necessitated by the changes in CARMONETTE IV and CARMONETTE V is shown in Annex B1.

Example of Inputs

As an example of the inputs for a CARMONETTE run a listing of the input cards for one of the father-son sets is shown in Annex B2.

Running Guide and Data Storage

The revised running guide and list of data storage allocations resulting from the changes in CARMONETTE V are shown in Annex B3.

Appendix A

PROBABILITIES OF DETECTION AND PROBABILITIES OF CHANGE IN INFORMATION STATE

PROBABILITIES OF DETECTION AND PROBABILITIES OF CHANGE IN INFORMATION STATE

PREVIOUS CARMONETTE TECHNIQUES

In the CARMONETTE III simulation the determination of target detection and of subsequent higher quality of information is a Markov chain process. The probability of acquiring a higher quality of information is dependent on the level of information now known about the target. The various probabilities are dependent on the range to the target, the cover available in the target grid square, and on target and observer activity. The observer-target range is identified in four range brackets which are determined by three solid angle threshold values of the visual solid angle presented to the observer by the target.

The simulation uses four states of information about a target: State 1 is "no information;" State 2 is target location known to the "nearest grid square;" State 3 is identified as "erroneous pinpoint;" the observer believes he knows the correct target location but in fact does not, direct fire at the target is ineffective; State 4 is "pinpoint," the target location is accurately known.

CARMONETTE IV DETECTION ROUTINES

In order to consider more explicitly the characteristics of the surveillance devices being examined, specific detection routines were developed* for t[illegible]ee of the four classes of sensors being played in the

*The detection routines were developed from information furnished by Dr. Walter Lawsen of the Night Vision Laboratory, Ft. Belvoir, Va., who also provided the input data requi[illegible]ed.

CARMONETTE IV simulation. In these routines the probability of detection of the target is separately computed for each target surveyed during each surveillance cycle. Appropriate factors such as target reflectance, background reflectance of the grid square occupied by the target, target dimensions, target speed (for radar), and device characteristics are inputs to the computational routines. Computational detection routines are provided for the visual, image intensifier, and radar classes of sensors. Such a detection routine is not provided for thermal sensors because of the greater complexity of the computations and the immediate unavailability of input data and device characteristics. Detection by thermal devices relies on the earlier concept of predetermined inputs for probability of detection.

The acquisition of a higher level of target information is based on the original CARMONETTE concept of a Target Information Transition Matrix for all devices.

IMAGE INTENSIFIER ROUTINE

The input and computational variables and the computation techniques for the image intensifier routine are shown in Table A1.

In the execution of the computations, those calculations which are based on the input values (night sky brightness and various constants) are performed in the preprocessor program. Figure A1 is a flow chart of these computations. The probability of detection calculations which use the target and background reflectance values are performed in the battle model program. Figure A2 is a flow chart of these computations.

Table A1

IMAGE INTENSIFIER MODEL CALCULATIONS

Symbol	Definition	Typical value or computation
σ_s	Scattering cross section	7.05×10^{-5}
σ_a	Absorption cross section	1.08×10^{-3}
C_G	Constant	0.75
N_2	Constant	0.256
t	Time constant, seconds	0.1
f	System "f" number	–
F_o	Objective lens focal length, mm	–
e_c	Electron charge, coulombs	1.6×10^{-19}
R	Observer - target range (m)	(calculated)
τ	Device transmission	0.92
$T(\gamma)$	Transfer function	Fig. A3
MTF	Modulation transfer function	$MTF = \int T(\gamma)d\gamma$
MTC	Modulation transfer constant	$MTC = \frac{1000}{MTF \cdot F_o}$
σ_r	Resolution length	$\sigma_r = \frac{1}{2\sqrt{2}\pi\, MTF}$
$B(\lambda)$	Night sky spectral radiance	
	Moonlight	$B(\lambda) = 10^{(-.237\lambda-7.87)} \times 10^{-2}$
	Part moon	$B(\lambda) = 10^{(+.480\lambda-8.76)} \times 10^{-2}$
	Starlight	$B(\lambda) = 10^{(+.145\lambda-9.95)} \times 10^{-2}$
$Q(\lambda)$	Photocathode sensitivity	Fig. A4
P_2	Computational variable	$P_2 = \frac{1}{e_c}\int B(\lambda)Q(\lambda)d\lambda$

Table A1 (continued)

Symbol	Definition	Typical value or computation
K_1	Computational variable	$K_1 = \frac{t\,\tau\,\pi}{4f^2}$
K_2	Computational variable	$K_2 = 4\,\pi\,\sigma_r^2$
$R_B(\lambda)$	Background reflectance	Table A2
$R_T(\lambda)$	Target reflectance	Table A3
M_1	Image intensifier background reflectance	$M_1 = \frac{1}{e_c} \int R_B(\lambda)B(\lambda)Q(\lambda)d\lambda$
M_2	Image intensifier target reflectance	$M_2 = \frac{1}{e_c} \int R_T(\lambda)B(\lambda)Q(\lambda)d\lambda$
T	Transmittance	$T = e^{-(\sigma_s + \sigma_a)R}$
K_3	Computational variable	$K_3 = 1 - e^{-\sigma_s R}$
C_o	Intrinsic contrast	$C_o = \frac{\lvert M_1 - M_2 \rvert}{M_1}$
C	Received contrast	$C = \frac{C_o}{1 + \frac{K_3\ P_2}{C_G \cdot T \cdot M_1}}$
N_B	Computational variable	$N_B = K_1 \quad M_1 \cdot T \cdot C_G + K_3 \cdot P_2$
N	Noise strength	$N = \frac{N_B}{K_2}^{\frac{1}{2}}$
S	Signal strength	$S = C \cdot N_B$
SN	Signal to noise ratio	$\frac{S}{N}$
N_{eff}	Computational variable	
	for SN < 5.0	$N_{eff} = SN \frac{2}{5}$ MTF
	for SN ≥ 5.0	$N_{eff} = 2MTF$
N_f	Computational variable	$N_f = 1000 \frac{MD}{R} N_{eff}$
P_D	Probability of detection	$P_D = 1 - e^{-(N_2 \cdot N_f^2)}$

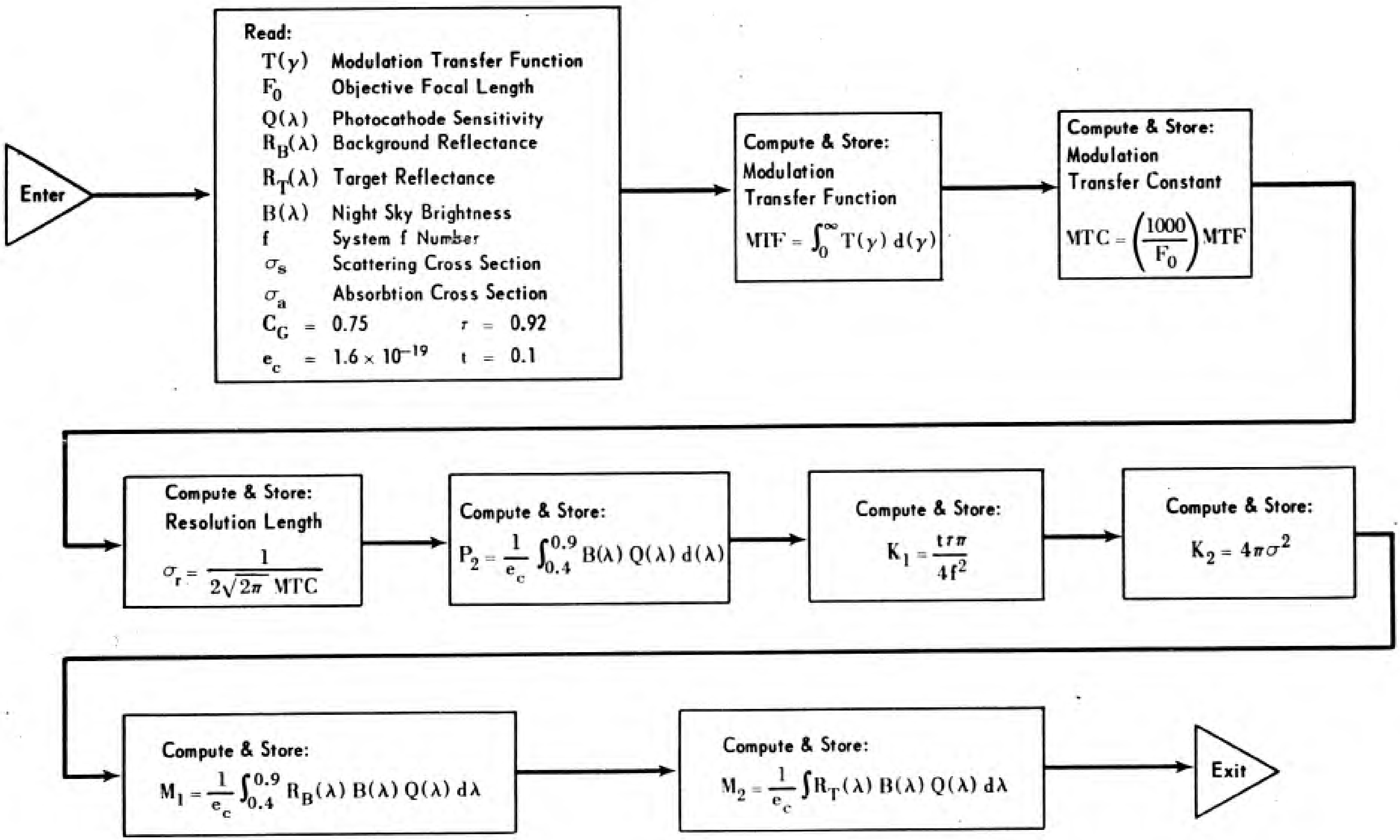

Fig. A1—Flow Chart—Preprocessor Computations—Image Intensifier Detection Model

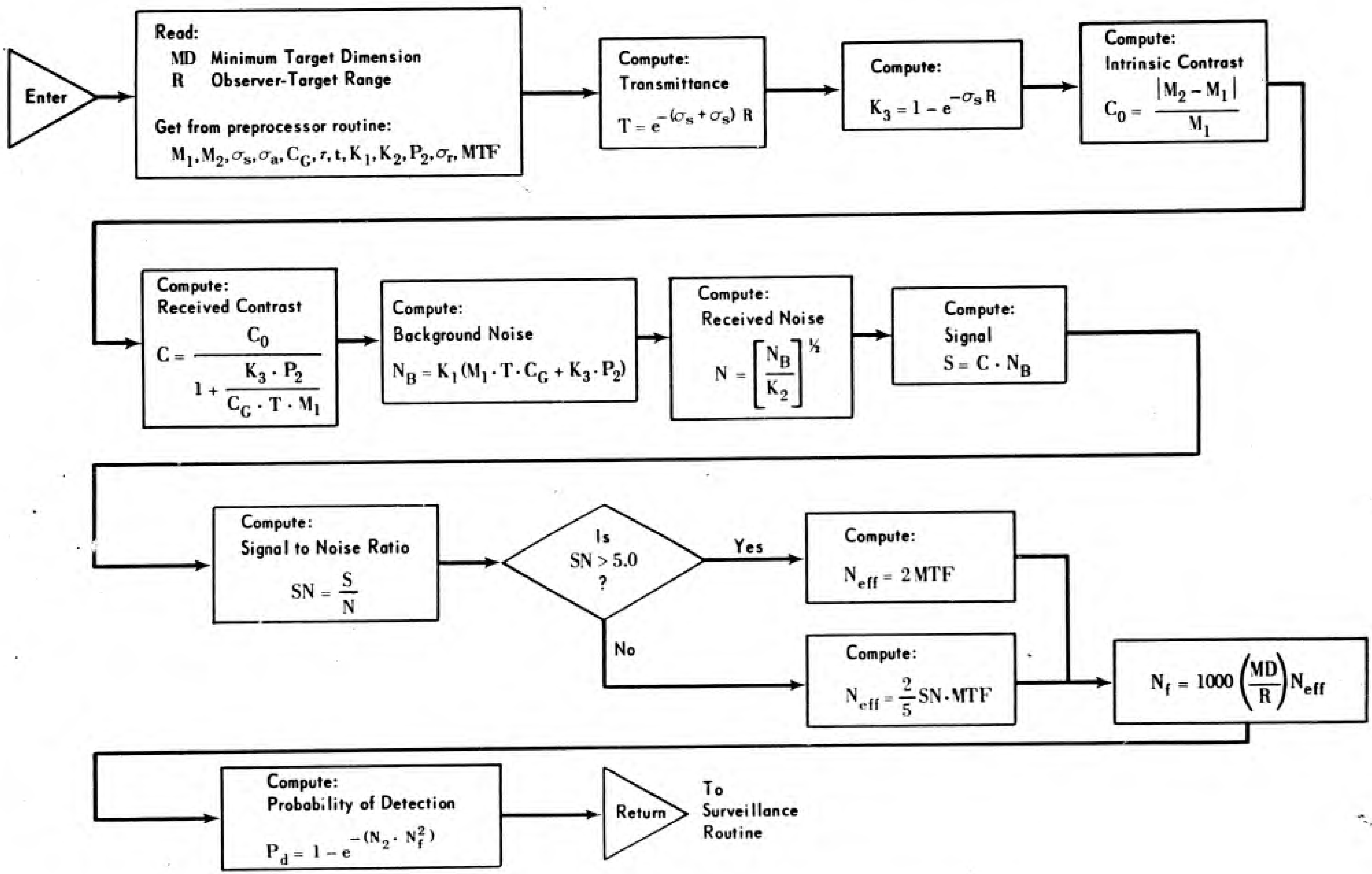

Fig. A2—Flow Chart—Probability of Detection—Image Intensifier

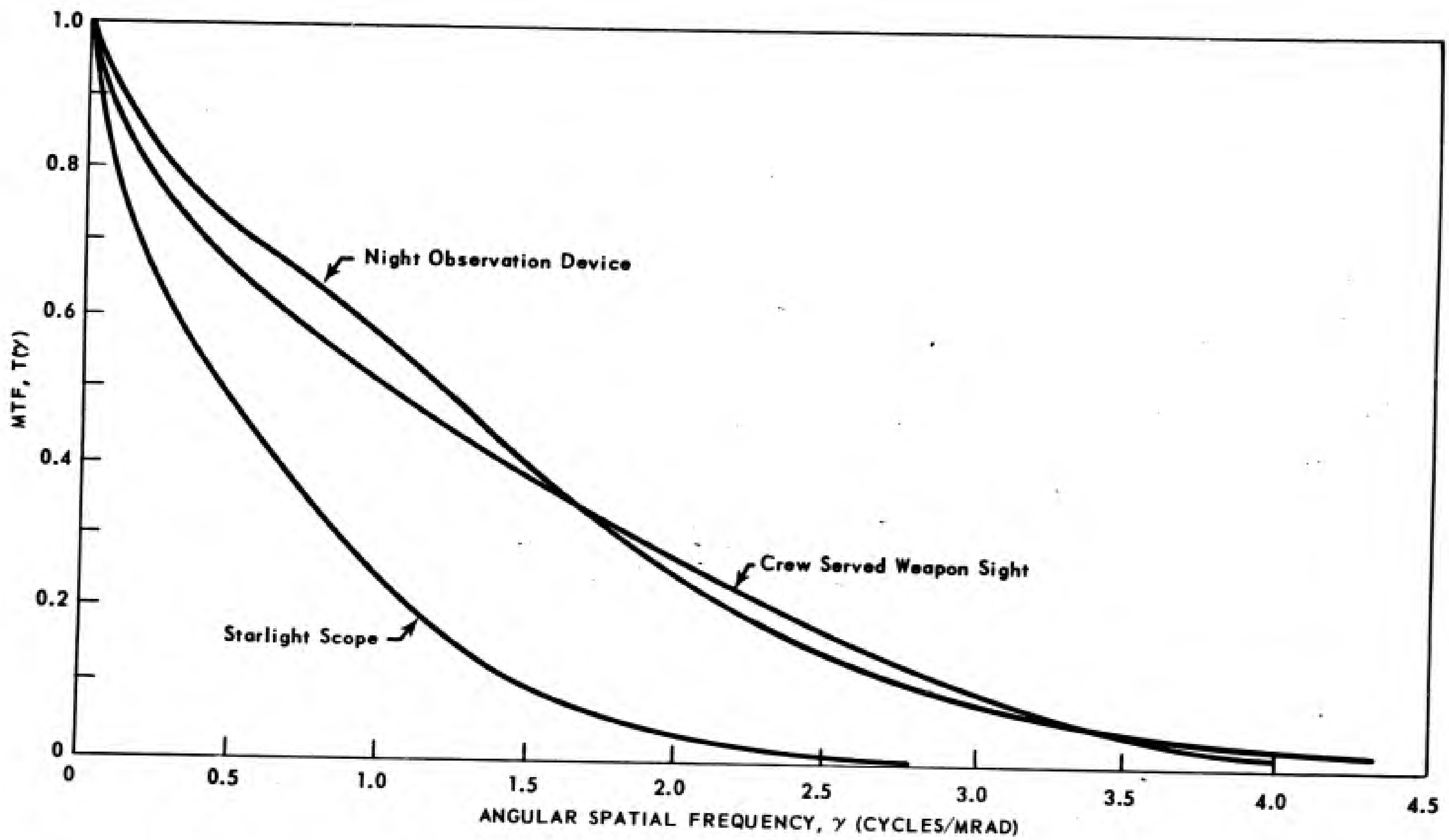

Fig. A3—System Modulation Transfer Function (MTF)

Note: The Modulation Transfer Function is a characteristic of an imaging system which expresses the loss in modulation in the output signal reference the input signal in relation to the object spatial frequency γ in cycles per milliradians.

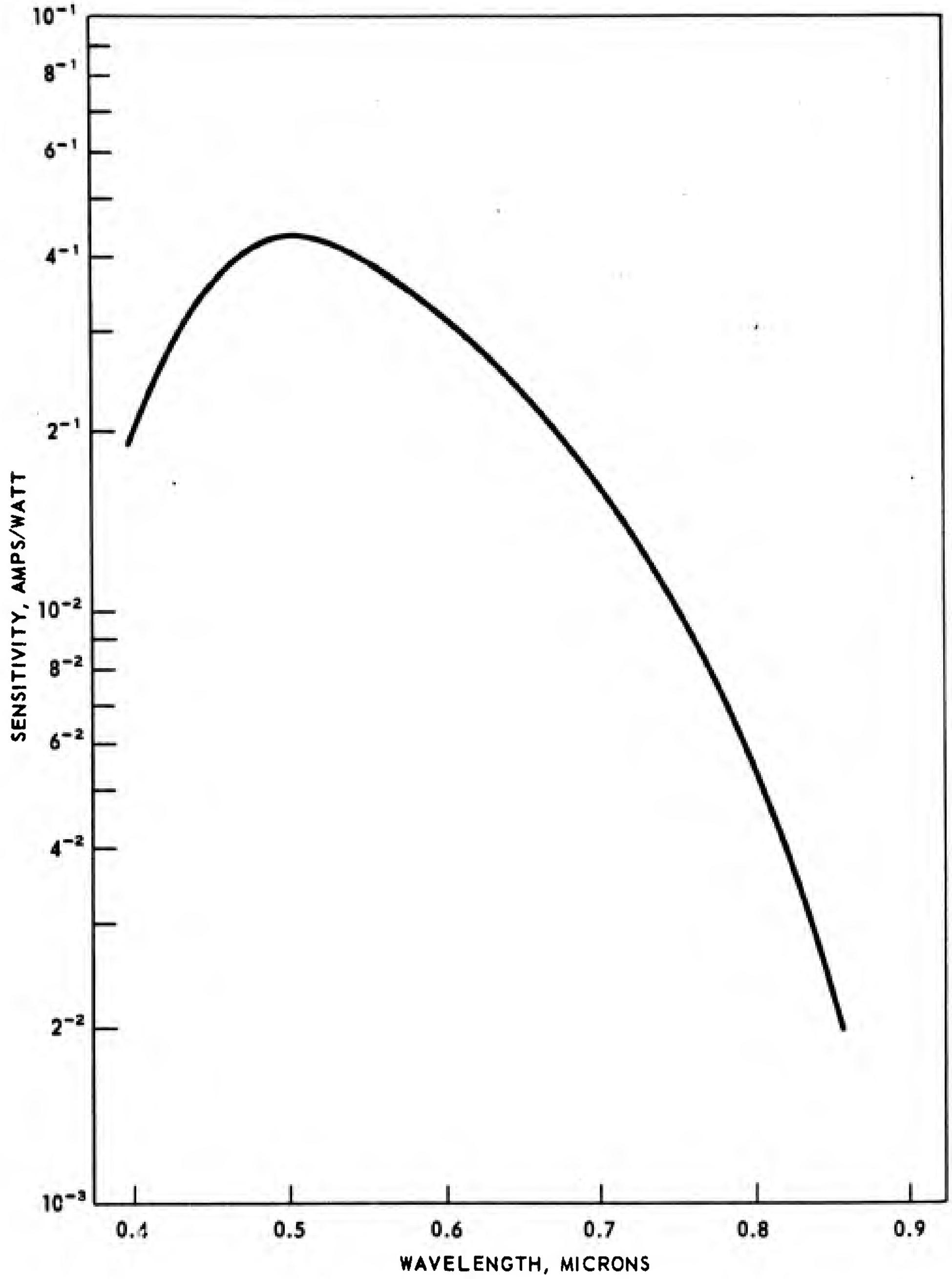

Fig. A4—S-20 Photocathode Sensitivity, Q(λ)

Note: The S-20 is the photocathode tube used in the first generation of passive night vision devices.

Table A2

BACKGROUND REFLECTANCE

Wave length (Microns)	Type background				
	Trees, grass (Summer)	Coniferous (Summer)	Trees, grass (Autumn)	Leaves	Elephant grass
0.4	0.04	0.04	0.05	0.03	0.05
0.5	0.07	0.04	0.08	0.05	0.05
0.6	0.12	0.08	0.20	0.12	0.05
0.7	0.18	0.14	0.32	0.18	0.12
0.8	0.52	0.28	0.54	0.20	0.38
0.9	0.56	0.32	0.56	0.19	0.41

Table A3

TARGET REFLECTANCE

Wave length (Microns)	Type target			
	Fatigues	Tank	Viet hat	Black shirt
0.4	0.05	0.10	0.18	0.05
0.5	0.05	0.11	0.25	0.05
0.6	0.08	0.13	0.30	0.05
0.7	0.12	0.13	0.38	0.08
0.8	0.25	0.13	0.52	0.15
0.9	0.32	0.13	0.55	0.16

VISUAL DETECTION ROUTINE

The input and computational variables and the computation techniques for the visual detection routine are shown in Table A4.

Figure A5 is a flow chart of the computations performed in the preprocessor program and Fig. A6 is a flow chart of the computations in the battle model program.

Table A4

VISUAL DETECTION MODEL CALCULATIONS

Symbol	Definition	Typical values or computations
σ_s	Scattering cross section	7.05×10^{-5}
σ_a	Absorption cross section	1.08×10^{-3}
C_G	Constant	0.75
α	Constant	0.5 unaided eye 33.0 7 x 50 binoculars
MD	Minimum dimension of target (meters)	0.1 - 7.9
MAG	Magnification	1.0 unaided eye 7.0 7 x 50 binoculars
N_1	Constant	1.5 unaided eye 0.01 7 x 50 binoculars
R	Observer target range	(calculated)
$B(\lambda)$	Night sky spectral radiance	
	Moonlight	$B(\lambda) = 10^{(-.237\lambda - 7.87)} \times 10^{-2}$
	Part moon	$B(\lambda) = 10^{(+.480\lambda - 8.76)} \times 10^{-2}$
	Starlight	$B(\lambda) = 10^{(+1.45\lambda - 9.95)} \times 10^{-2}$
$R_B(\lambda)$	Background reflectance	Table A2
$R_T(\lambda)$	Target reflectance	Table A3

Table A4 (continued)

Symbol	Definition	Typical values or computations
$K(\lambda)$	Relative sensitivity of the eye	Table A5
β	Angular size of a minimal visible target (Blackwell)	Figure A7
M_3	Visual background reflectance	$M_3 = \int R_B(\lambda)B(\lambda)K(\lambda)d\lambda$
M_4	Visual target reflectance	$M_4 = \int R_T(\lambda)B(\lambda)K(\lambda)d\lambda$
P_1	Integral of night sky brightness	$P_1 = \int B(\lambda)K(\lambda)d\lambda$
LL	Light level	$LL = \pi\, \alpha\, (685)(9.3 \times 10^4)P_1$
T	Transmittance	$T = e^{-(\sigma_s + \sigma_a)R}$
K_3	Computational variable	$K_3 = 1 - e^{-\sigma_s R}$
C_o	Intrinsic contrast	$C_o = \frac{\lvert M_4 - M_3 \rvert}{M_3}$
C	Perceived contrast	$C = \frac{C_o}{1 + \frac{K_3 \cdot P_1}{C_G \cdot T \cdot M_3}}$
N_f	Computational variable	$N_f = \frac{MD \cdot MAG}{R} (57)(60) \frac{1}{\beta}$
P_D	Probability of detection	$P_D = 1 - e^{(-N_1 \cdot N_f^2)}$

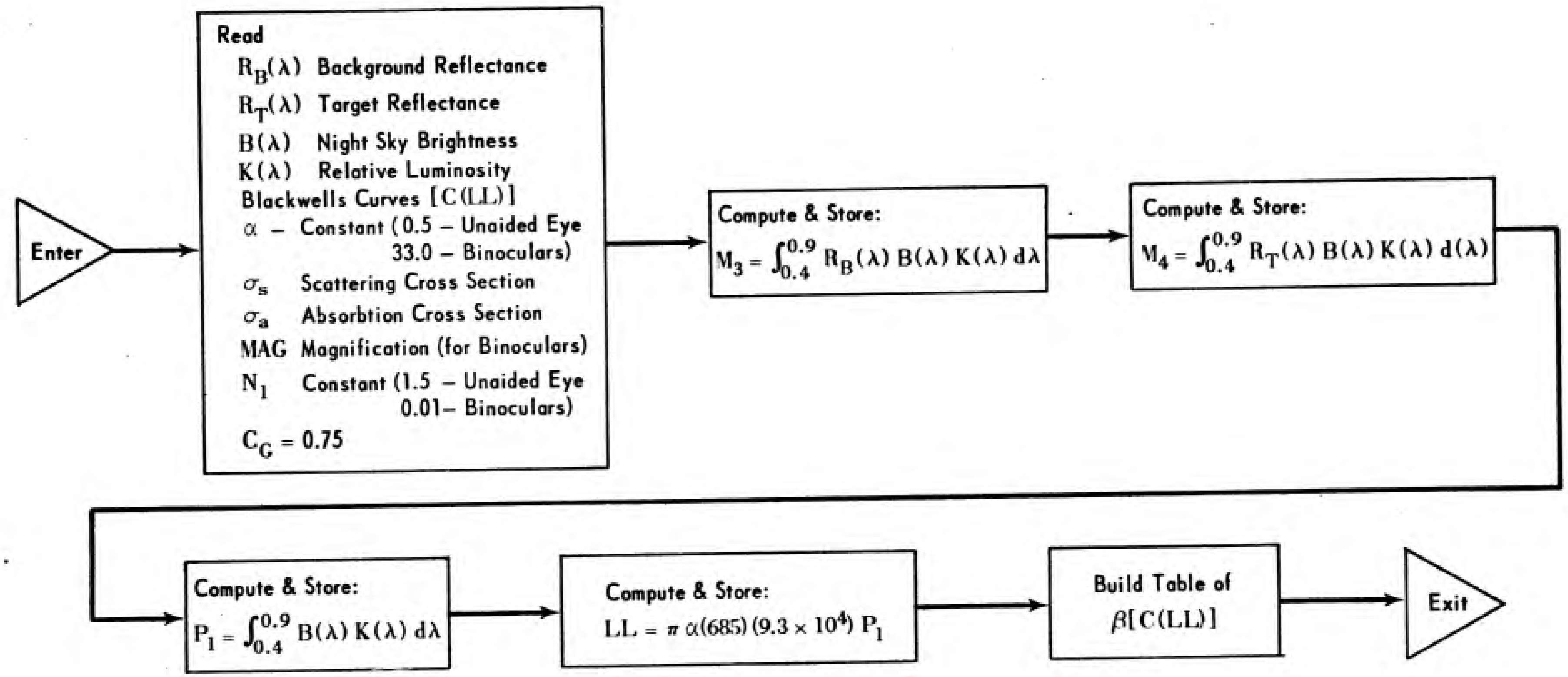

Fig. A5—Flow Chart—Preprocessor Computations—Visual Detection Model

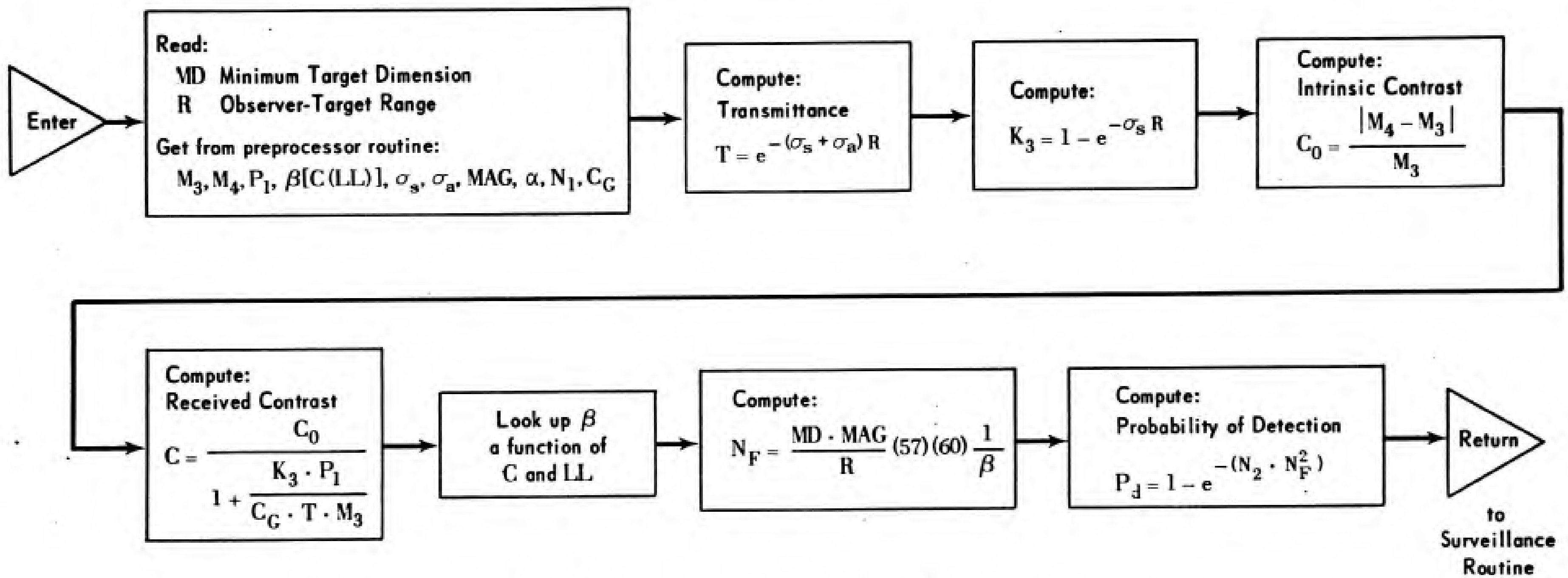

Fig. A6—Flow Chart—Probability of Detection—Visual

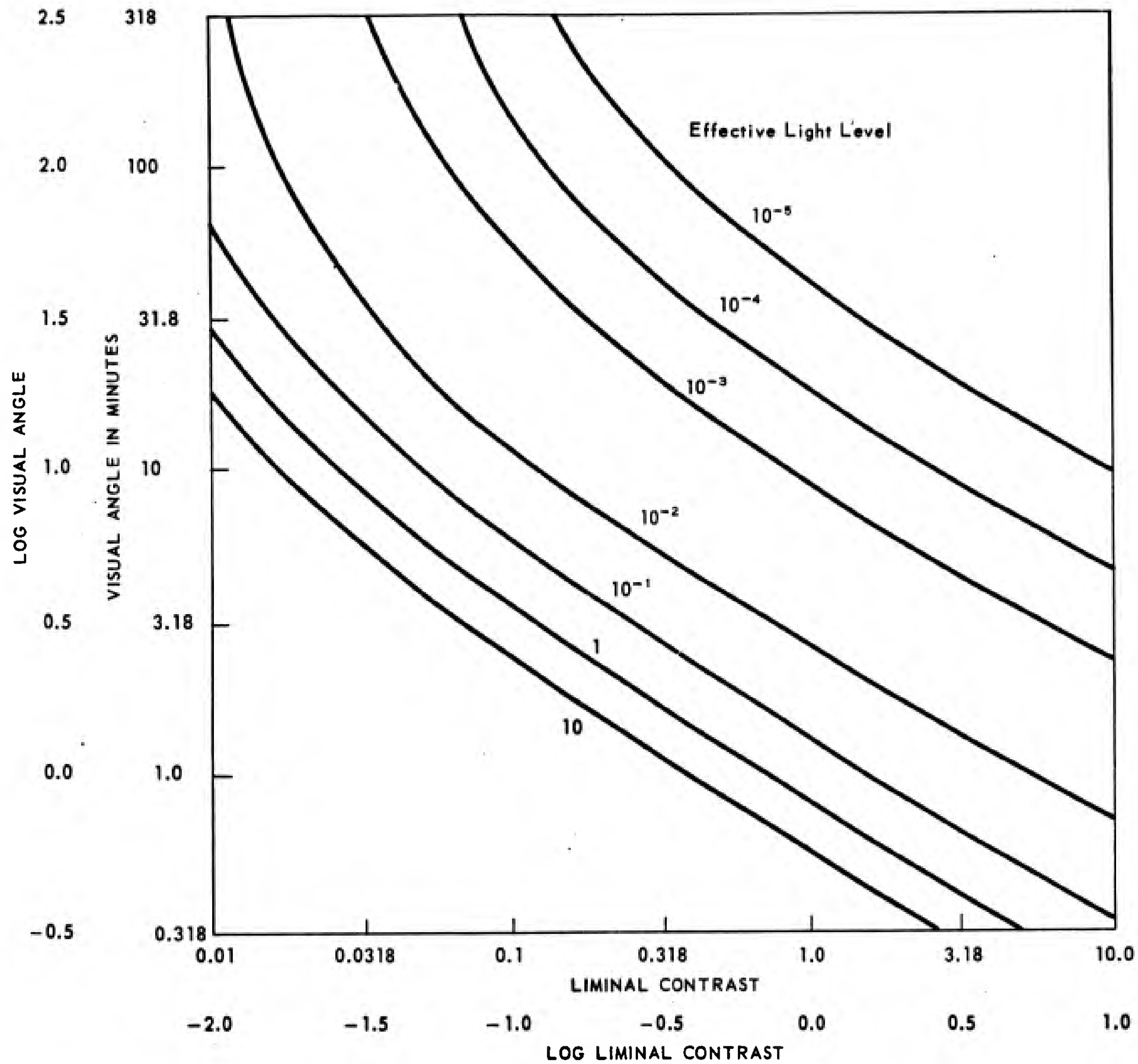

Fig. A7—Blackwell's Curves

Note: These curves show the angle subtended by a barely detectable target in relation to the target-background contrast and light level.

Table A5

RELATIVE SENSITIVITY OF THE EYE

Wave length (Microns)	K_λ
0.4	4.37×10^{-3}
0.5	2.69×10^{-1}
0.6	7.47×10^{-1}
0.7	3.55×10^{-3}
0.8	3.89×10^{-6}
0.9	1.70×10^{-8}

USE OF SENSOR CLASS IDENTIFIERS

In the CARMONETTE IV games the visual sensors, unaided eye and binoculars, were identified as Sensor Class 1. The image intensifier sensors were Sensor Class 2. The radars were Sensor Class 4. The Surveillance Routine is written so that these sensor classes are routed to the appropriate detection routines and then returned to the Surveillance Routine.

The other available sensor classes, i.e., 3, 5, and 6, are routed directly to the Target Acquisition Routine for determination of targets detected as well as the higher levels of information in accordance with the CARMONETTE III logic of the "Change of Information State Matrix."

There is no particular significance to these classes except that they provide for the possibility of inputting different values of detection probabilities.

Appendix B

CHANGES FOR THE CARMONETTE PROGRAM

CHANGES FOR THE CARMONETTE PROGRAM

GENERAL

The changes in the program required by the expansion of the number of units from 36 to 48 and the expansion of the map size from 36 by 63 grids to 60 by 63 grids did not require any changes in program logic. The necessary changes to the input forms are shown in Annex B1.

The revised data storage words required by all of the program changes are shown in Annex B2.

REMOUNT ROUTINE

In using the remount order the passenger unit must be mounted in the carrier unit at the beginning of the game. If the starting location of the passenger unit is to be the initial position for dismounted action, the first order to both the passenger unit and carrier unit must be "DISMOUNT." The carrier unit orders can then cause it to move to a rearward covered position. When the remount action is to occur the orders to each unit must cause them to move into a common grid square and then give each of them the order, "REMOUNT." If either the passenger unit or the carrier unit is killed while they are separated, the surviving unit will go to the ordered remounting square, find out that his partner is dead, drop to his next order and proceed on his mission. If the surviving unit was the passenger the movement in implementing the next order will be at the dismounted rate.

In the ECF games the TOW squads were given "out of ammunition" contingency orders which caused them to go to a covered position (escape point) when their 10 TOW missiles were expended. In at least one of the ECF delay games it was found that a TOW squad ran out of ammunition at the forward position and proceeded to move to the escape point prior to the time that it was to remount. The carrier for the squad, in attempting to carry out its portion of the remount order, moved to the ordered remount point at the proper time and waited there for the rest of the game. This anomaly in the program has been corrected so that the carrier unit will also go to the escape point when its passenger unit does.

HELICOPTER MODEL

As previously stated, the helicopter model can simulate the actions of attack helicopters, reconnaissance helicopters and troop transport helicopters. The different types are identified by air mobility class Nrs 5, 6, and 7 (Form 18 and 19, Vol II, R-28) as follows:

Mobility class	Type helicopter
5	Attack
6	Reconnaissance
7	Transport

All types of helicopters are also identified as fire response Class 5 on Form 7.

Helicopter units can be single or multiple element units just as any other CARMONETTE units.

Helicopter units can be given any type of order that is available in the CARMONETTE repertoire of orders except that an altitude index (from Form 20) must be included in the helicopter movement orders. Several new orders for the Attack Helicopter Routine were also necessary.

The Attack Helicopter Routine is based on a Call Helicopter Routine similar in concept to the former Call Artillery Routine in CARMONETTE IV. Any command, control, and surveillance unit (CCSU) can be given the authority to Call Helo by an "X" in the appropriate column

on Form 36. This form has also been expanded to provide a set of target priorities against which the command unit will call helicopters or artillery.

Three new orders were created for the Helicopter Routine. These orders are:

Narrative order	Coded form
Change altitude to get line of sight to target	CHAL LOS
Change altitude to treetop	CHAL TRTP
Change altitude to land	CHAL LAND

In implementation of the Attack Helicopter Routine a sample set of possible orders to a helicopter unit is shown in Fig. B1.

The STAY 5000 order puts the helicopter in an on-call status. When a command unit with authority to call helicopters identifies a target that is on his target priority list to at least the erroneous pinpoint level of information a non-busy helicopter subordinate to that command unit is called. The target number and location of the target is given to the helicopter (to the nearest square level of intelligence). The helicopter moves to the coordinates given in the move order. (This location is selected by the order/scenario writer based on the tactical situation being simulated.) When the helicopter reaches the specified "pop-up" location the computer determines the present location of the specified target and checks to see if line of sight exists from the pop-up point to the present target location at the maximum permitted altitude. In making this LOS check for the helicopter, when LOS is determined to exist, the computer also turns on the bit representing the helicopter in the enemy unit(s) LOS word. If the answer is "yes" the helicopter raises vertically to the minimum altitude required to achieve line of sight.

On reaching line-of-sight altitude the helicopter performs surveillance and target acquisition immediately without regard to the previously established surveillance time cycle. Surveillance will be performed again at current time plus surveillance cycle if the "stay interval" for

ATTACK HELICOPTER ORDERS

1. STAY until TIME 1.0 (this is a required first order. The time value can be any value larger than 1.0 minutes).

2. STAY until TIME 500.0 (Helo is waiting to be called)(Command unit calls helo to Atk Tgt Type at specified square)

3. Move no Stopping RATE_____ to Square _____,_____ Altitude _______

4. Change Altitude to get LOS (Maximum altitude is listed in Form 18)

5. Stay Interval X.XX or FIRE 1 KIND 4 PRIORITY 1

   (Helicopter performs Surveillance/Tgt Acq and fires at appropriate detected targets)

6. Change Altitude to Treetop

7. Stay Interval X.XX

   (Repeat #4 - #7 as desired)(If fired at in sufficient volume to cause response skip to next move order)

15. Move No Stopping RATE ____ to Square ____,____ Altitude ____

16. Change Altitude to LAND

17. Stay Interval X.XX

19. SKIP BACK 17 Unconditionally

   (The successive "pop-ups" can be at different locations by inserting a Move Order after #6)

Fig. B1 — Sample Set of Helicopter Orders

the helicopter permits and if the helicopter has not aborted the action because of enemy fire. Each enemy unit in line of sight is processed for detection. If targets are detected the helicopter then selects a target based on the target priority list for his weapon. The target selected may or may not be the same target against which he was called. If no targets are detected to at least the erroneous pinpoint level, the helicopter unit will remain in that position for the interval specified in the order and then drop to the next order.

Any enemy unit that is in line of sight and that conducts surveillance and detects the helicopter while the helicopter is exposed may fire at the helicopter if it is on the target priority list for any of its weapons. The surveillance cycle for the enemy AD units should be related to the "stay interval" of the helicopter so that the enemy units will have an opportunity to execute a surveillance/target acquisition cycle while the helicopter is exposed. It was also found to be necessary to identify the enemy AD weapons as "guided missiles" (on Form 1) to prevent the assessment of impact after the helicopter had dropped out of LOS but before the computer performed the next LOS check.

After firing the specified number of rounds or waiting the specified time, the helicopter will drop to the next order.

In the Air Movement Routine the line-of-sight calculation, normally conducted at each boundary crossing for ground units, is conducted for air units only at the destination of each movement order. This change was made to reduce the number of repetitive computer calculations and thus hold down computer running time.

A reconnaissance helicopter unit can be given "fly-by" orders and if made the "buddy unit" of a command unit, the computer will simulate the calling of attack helicopters against targets from an airborne command post.

ARTILLERY ASSESSMENT AGAINST VEHICLES

The input form used to enter the kill probability of artillery and mortar against infantry (Form 14) has been revised to include a kill

probability against vehicles. An example of the revised form is shown in Annex B1. It should be noted that this kill probability is entered as a four-digit decimal fraction. The type vehicle target is identified by "target class number." If any type of weapon or type of ammunition is not effective against a particular type vehicle, no entry is made at that point.

In determining the numerical value of these entries the calculation of the number of submissiles impacting in each grid square must first be done. Then the kill probability is:

$$P_k = \frac{\text{vulnerable area of vehicle}}{\text{area of grid square}} \times \text{Nr of submissiles}$$

$$\times \text{ probability of kill given a hit.}$$

RANGE OF ENGAGEMENT SUMMARY

An example of the printout from the range summary is shown in Figs. B2 and B3.

Instructions for producing this summary from the battle history tape are given in the Running Guide in Annex B3.

NEW AND REVISED ORDER FORMATS

In CARMONETTE III the total number of possible orders was limited to 250. In CARMONETTE IV the possible number of orders was increased to 500 and in the revisions for CARMONETTE V the possible number of orders was increased to 999. This change does not require any change in the technique of preparing orders.

The new remount order has the coded format for: REMØ

The altitude index for helicopter movement orders is entered as qualifier 5. The coded format of a helicopter movement order is:

NSTP RATE 7 SQRE XXYY KIND 6 PRØR 1 ALTD 2

TREATMENT NO. 4202 REPLICATION NO. 3 03/18/72

BLUE WEAPON NO. 9 (105-mm Tank Gun)

RED TARGET CLASSES

	7 (Red Tank)				8 (Red APC)				14 (Manpack SAGGER)			
	ENG	RDS	VEH	TPS	ENG	RDS	VEH	TPS	ENG	RDS	VEH	TPS
1001 1500	0	0	0	0	1	1	0	0	0	0	0	0
1501 2000	15	15	1	2	16	16	0	0	3	3	0	0
2001 2500	19	19	0	0	8	8	0	0	0	0	0	0
2501 3000	13	13	0	0	0	0	0	0	0	0	0	0

TREATMENT NO. 4202 REPLICATION NO. 3 03/18/72

BLUE WEAPON NO. 15 (TOW)

RED TARGET CLASSES

	7 (Red Tank)				8 (Red APC)			
	ENG	RDS	VEH	TPS	ENG	RDS	VEH	TPS
2501 3000	36	36	9	18	4	4	1	3

TREATMENT NO. 4202 REPLICATION NO. 3 03/18/72

BLUE WEAPON NO. 16 (DRAGON)

RED TARGET CLASSES

	8 (Red APC)				10 (Manpack 76 RR)			
	ENG	RDS	VEH	TPS	ENG	RDS	VEH	TPS
501 1000	11	11	1	3	4	4	0	0

Fig. B2—Range of Engagement Printout, Each Replication

Order* no.	Order	1: Qual 1	1: Number 1	2: Qual 2	2: Number 2	3: Qual 3	3: Number 3	4: Qual 4	4: Number 4	5: Qual 5	5: Number 5
15	REMØ										
22	NSTP	RATE	7	SQRE	XXYY	KIND	6	PRØR	1	ALT	2
31	CHAL	LØS									
33	CHAL	TRTP									
41	CHAL	LAND									

Fig. B3—Example of Form 32, New Order Form

This qualifier is not entered on movement orders for ground units since the computer will read the blank as zero and the ground unit will move at zero altitude.

The change altitude orders for the Attack Helicopter Routine are:

Narrative	Coded
Change altitude to get LOS	CHAL LØS
Change altitude to treetop	CHAL TRTP
Change altitude to land	CHAL LAND

Figure B3 shows the new order forms as entered on a copy of the CARMONETTE Form 32, Orders.

Annex B1

INPUT FORMS

GENERAL

In the extension of CARMONETTE III to CARMONETTE IV, it was necessary to revise certain of the input data forms and to develop several new forms for the inputs concerning the command, control, and surveillance units and the various sensors now included in the simulation. Additional changes were required for CARMONETTE V. This annex presents the new and revised forms for both CARMONETTE IV and CARMONETTE V. For information concerning the other forms used for CARMONETTE inputs the reader is referred to Vol II of the CARMONETTE III documentation.[4]

FORM 3 — ORDER OF BATTLE

The only change in this form is the expansion of the form to provide for entries for 48 units. Figures B4 and B5 show examples of this form.

FORM 4 — UNIT DESCRIPTION

Form 4 — Unit Description (Blue and Red), has been revised and expanded so that sensor class and sensor height can be entered. Form 4 is used for the weapon units of each side.

On the first line of Form 4 — Blue, Card No. 495, the total number of Blue and Red units being played is entered. The number of weapon units is entered in columns 2 to 5 and the number of CCS units is entered in columns 12 to 15. The superior headquarters (CCS unit) of the weapon unit is entered in columns 21 and 22. A superior headquarters identification

must be entered for each unit listed. The superior headquarters identification numbers must start with 49 regardless of the number of weapon units and cannot be larger than 63. For CARMONETTE V these forms were expanded to provide for 48 weapon units. Figures B6 and B7 show examples of Form 4 – Blue and Form 4 – Red.

FORM 3—BLUE

ORDER OF BATTLE

CARMONETTE V

Side	Unit no.	Main weapon Type	Main weapon Amt	Quantity ammo Type I	Quantity ammo Type II	Weapon B Type	Weapon B Amt	Quantity ammo Type I	Quantity ammo Type II	Weapon C Type	Weapon C Amt	Quantity ammo Type I	Quantity ammo Type II	Weapon D Type	Weapon D Amt	Quantity ammo Type I	Quantity ammo Type II	Men	Veh	Drivers	Unit area (meters^2)	Element area (m^2)	Sensor ht. (m)	TC?	UTM?	UTF?	D?	CA?	HF?	Identification ID	Identification Seq. no.
1	2 3	4 5	6 7	8 9 10 11	12 13 14 15	16 17	18 19	20 21 22 23	24 25 26 27	28 29	30 31	32 33 34 35	36 37 38 39	40 41	42 43	44 45 46 47	48 49 50 51	52 53	54 55	56 57	58 59 60 61 62	63 64	65 66	67	68	69	70	71	72	73 74 75 76	77 78 79 80
	BLUE			RED	ENTER HOLD FIRE RANGE FOR EACH SIDE IN METERS ON THIS CARD ONLY																									UNT2	4 2 2
B	01																													UNIT2	4213
B	02																													UNIT2	4214
B	03																													UNIT2	4215
B	04																													UNIT2	4216
B	05																													UNIT2	4217
B	06																													UNIT2	4218
B	07																													UNIT2	4219
B	08																													UNIT2	4310
																														UNIT2	4311
																														UNIT2	4312
B	317																													UNIT2	4313
B	318																													UNIT2	4314
B	319																													UNIT2	4315
B	410																													UNIT2	4316
B	411																													UNIT2	4317
B	412																													UNIT2	4318
B	413																														
B	414																														
B	415																													UNIT2	4617
B	416																													UNIT2	4618
B	417																													UNIT2	4619
B	418																													UNIT2	4710

TC ~ X, if unit is primarily a troop carrier? The next unit must refer to the dismounted troops.
UTM ~ X, if unit unable to move?
UTF ~ X, if unit unable to fire?

D ~ X, if troops dismount when hit?
CA ~ X, if unit able to call artillery?
HF ~ X, if unit holds fire until white eye range?

Fig. B4 - Form 3— Blue Order of Battle

FORM 3—RED

ORDER OF BATTLE

CARMONETTE V

Side	Unit no.	Main weapon Type	Main weapon Amt	Quantity ammo Type I	Quantity ammo Type II	Weapon B Type	Weapon B Amt	Quantity ammo Type I	Quantity ammo Type II	Weapon C Type	Weapon C Amt	Quantity ammo Type I	Quantity ammo Type II	Weapon D Type	Weapon D Amt	Quantity ammo Type I	Quantity ammo Type II	Men	Veh	Drivers	Unit area (meters^2)	Element area (m^2)	Sensor ht. (m)	TC?	UTM?	UTF?	D?	CA?	HF?	Identification ID	Identification Seq. no.
1	2 3	4 5	6 7	8 9 10 11	12 13 14 15	16 17	18 19	20 21 22 23	24 25 26 27	28 29	30 31	32 33 34 35	36 37 38 39	40 41	42 43	44 45 46 47	48 49 50 51	52 53	54 55	56 57	58 59 60 61 62	63 64	65 66	67	68	69	70	71	72	73 74 75 76	77 78 79 80
R	01																													UNT2	4711
R	02																													UNT2	4712
R	03																													UNT2	4713
R	04																													UNT2	4714
R	05																													UNT2	4715
R	06																													UNT2	4716
R	07																													UNT2	4717
R	08																													UNT2	4718
R	09																													UNT2	4719
R	10																													UNT2	4810
R	11																													UNT2	4811
																														UNT2	4812
R	34																													UNT2	4813
R	35																													UNT2	4814
R	36																													UNT2	4815
R	37																													UNT2	4816
R	38																													UNT2	4817
R	39																													UNT2	4818
R	40																													UNT2	4819
R	41																													UNT2	4910
R	42																													UNT2	4911
R	43																													UNT2	4912
R	44																													UNT2	5115
R	45																													UNT2	5116
R	46																													UNT2	5117
R	47																													UNT2	5118
R	48																														

TC — X, if unit is primarily a troop carrier? The next unit must refer to the dismounted troops.
UTM — X, if unit unable to move?
UTF — X, if unit unable to fire?

D — X, if troops dismount when hit?
CA — X, if unit able to call artillery?
HF — X, if unit holds fire until white eye range?

Fig. B5 - Form 3—Red Order of Battle

FORM 4—BLUE

UNIT DESCRIPTION

CARMONETTE V

Side	Unit no. (No. of RPN units: Blue, Red)	Target class	Vulnerability class	Elm size index	Mobility class	Fire response class	Sensor: Class	Sensor: Type	Max men per vehicle (No. of CCS units: Blue, Red)	Fraction of time unavailable	Superior HQ	Identification: ID	Identification: Seq. no.
1	2 3	4 5	6 7	8	9	10	11	12	13 14	15 16	17 18	73 74 75 76	77 78 79 80
B	011											UNT4	4995
B	012											UNT4	4996
B	013											UNT4	4997
B	014											UNT4	4998
B	015											UNT4	4999
B	016											UNT4	5000
B	017											UNT4	5001
B	018											UNT4	5002
B	019											UNT4	5003
B	110											UNT4	5004
B	111											UNT4	5005
												UNT4	5006
												UNT4	5007
												UNT4	5008
												UNT4	5009
												UNT4	5010
												UNT4	5011
												UNT4	5012
B	313												
B	314												
B	315												
B	316												
B	317												
B	318												
B	319											UNT4	5134
B	410											UNT4	5135
B	411											UNT4	5136
B	412											UNT4	5137
B	413											UNT4	5138
B	414											UNT4	5139
B	415											UNT4	5140
B	416											UNT4	5141
B	417											UNT4	5142
B	418											UNT4	5143

Fig. B6 — Example of Form 4— Blue

FORM 4—RED

UNIT DESCRIPTION

CARMONETTE V

Side (1)	Unit no. (2–3)	Target class (4–5)	Vulnerability class (6–7)	Elm size index (8)	Mobility class (9)	Fire response class (10)	Sensor Class (11)	Sensor Type (12)	Max men per vehicle (13–14)	Fraction of time unavailable (15–16)	Superior HQ (17–18)
R	01										
R	02										
R	03										
R	04										
R	05										
R	06										
R	07										
R	08										
R	09										
R	10										
R	11										
R	12										
R	13										
R	14										
R	34										
R	35										
R	36										
R	37										
R	38										
R	39										
R	40										
R	41										
R	42										
R	43										
R	44										
R	45										
R	46										
R	47										
R	48										

Columns 19–72 blank.

Identification: ID (73–76)	Seq. no. (77–80)
UNT4	544
UNT4	545
UNT4	546
UNT4	547
UNT4	548
UNT4	549
UNT4	550
UNT4	551
UNT4	552
UNT4	553
UNT4	554
UNT4	555
UNT4	556
UNT4	557
UNT4	558
UNT4	559
UNT4	560
UNT4	561
UNT4	562
UNT4	563
UNT4	564
UNT4	584
UNT4	585
UNT4	586
UNT4	587
UNT4	588
UNT4	589
UNT4	590
UNT4	591

Fig. B7 — Example of Form 4— Red

FORM 14 — PROBABILITY OF KILLING INFANTRY

This form, which is used to input the kill probabilities of fragmenting munitions, is expanded to provide for entries for the kill probabilities against vehicles for weapons 1 through 8. In CARMONETTE weapons 1 through 8 are direct fire weapons. Provision is made for entries for two types of ammunition for each weapon. Note that the entries for P_k against vehicles is a four-digit decimal fraction compared to the two-digit entry for the P_k against dismounted infantry. Figure B8 shows an example of this form.

FORM 14

PROBABILITY OF KILLING INFANTRY AND VEHICLES WITH FRAGMENTING AND DUAL PURPOSE MUNITIONS

CARMONETTE V

Weapon	Ammo	Infantry: Responding to hostile fire, States 1, 2, or 3 — Net cover state 1	2	3	Infantry: Not responding to hostile fire, State 4 — Net cover state 1	2	3	Vehicles — Vulnerability class 1	2	3	4		Identification: ID	Seq. no.
1 2	3	4 5	6 7	8 9	10 11	12 13	14 15	16 17 18 19	20 21 22 23	24 25 26 27	28 29 30 31	32–72	73 74 75 76	77 78 79 80
11	1												WPN8	685
11	2												WPN8	686
12	1												WPN8	687
12	2												WPN8	688
13	1												WPN8	689
13	2												WPN8	690
													WPN8	691
													WPN8	692
													WPN8	693
													WPN8	694
													WPN8	695
													WPN8	696
													WPN8	697
													WPN8	698
10	1													
10	2													
11	1													
11	2													
12	1													
12	2													
13	1													
13	2													
14	1												WPN8	711
14	2												WPN8	712
15	1												WPN8	713
15	2												WPN8	714
16	1												WPN8	715
16	2												WPN8	716
17	1												WPN8	717
17	2												WPN8	718
18	1												WPN8	719
18	2												WPN8	720

Fig. B8 - Form 14— Probability of Killing Infantry and Vehicles With Fragmenting and Dual Purpose Munitions

FORM 22 — SENSOR CLASS TABLES

Form 22 — Sensor Class Tables, has been revised to include the solid angle thresholds for both nonfiring and firing targets. The firing target information was formerly input on Form 30. Values for the maximum and minimum sensor ranges against nonfiring targets and for the maximum range against firing targets are entered on this form. The form has been expanded to provide for entries for six classes of sensors with a possible six types in each class. An example of the new Form 22 is shown in Fig. B9.

FORM 22
SENSOR CLASS TABLES
CARMONETTE IV

Sensor Class & Type (1–2)	Probability of Loss of Tgt Info (3–4)	Scan Interval (Min.) (5–8)	Non-Firing Targets: Solid Angle Threshold α1 (9–15)	α2 (16–22)	α3 (23–29)	Sensor Ranges (Meters) Min (30–34)	Max (35–39)	Firing Targets: Solid Angle Threshold β1 (40–46)	β2 (47–53)	β3 (54–60)	Sensor Range (Meters) Max (61–65)	(66–72)	Identification: ID (73–76)	Seq. No. (77–80)
1 1			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 6 1
1 2			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 6 2
1 3			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 6 3
1 4			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 6 4
1 5			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 6 5
1 6			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 6 6
2 1			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 6 7
2 2			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 6 8
2 3			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 6 9
2 4			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 7 0
2 5			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 7 1
2 6			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 7 2
4 4			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 7 3
4 5			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 7 4
4 6			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 7 5
5 1			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 7 6
5 2			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 7 7
5 3			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 7 8
5 4			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 8 8
5 5			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 8 9
5 6			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 9 0
6 1			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 9 1
6 2			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 9 2
6 3			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 9 3
6 4			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 9 4
6 5			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 9 5
6 6			. E –	. E –	. E –			. E –	. E –	. E –			S E N S	9 9 6

Fig. B9 — Example of Form 22

FORMS 23 - 29 — PROBABILITY OF CHANGES IN INTELLIGENCE

Forms 23 through 29 have been expanded to provide for entries for six sensor classes with a possible six types in each class. The order of entries in relation to the different states of target and observer activity and target solid angle class has been changed so that the order matches the computer program indexing order. Figures B10 through B16 show examples of the revised Forms 23 through 29.

FORM 23
PROBABILITY OF NOT DETECTING A TARGET
CARMONETTE IV

Sensor Class	Sensor Type	Card No.	4–20	Target Activity: Not Moving; Observer Activity: Not Neutralized; Target Solid Angle Class 1 (21–22)	2 (23–24)	3 (25–26)	4 (27–28)	Not Moving; Neutralized; 1 (29–30)	2 (31–32)	3 (33–34)	4 (35–36)	Moving; Not Neutralized; 1 (37–38)	2 (39–40)	3 (41–42)	4 (43–44)	Moving; Neutralized; 1 (45–46)	2 (47–48)	3 (49–50)	4 (51–52)	53–72
1	1	1																		
1	2	1																		
1	3	1																		
1	4	1																		
1	5	1																		
5	1	1																		
5	2	1																		
5	3	1																		
5	4	1																		
5	5	1																		
5	6	1																		
6	1	1																		
6	2	1																		
6	3	1																		
6	4	1																		
6	5	1																		
6	6	1																		

Each entry in Form 23 must be greater than zero and less one minus the sum of the corresponding entries in Form 24 and Form 25.

Target Solid Angle Class
1. $A < \alpha_1$ (from Form 22)
2. $\alpha_1 \leq A < \alpha_2$ (from Form 22)
3. $\alpha_2 \leq A < \alpha_3$ (from Form 22)
4. $A \geq \alpha_3$

Identification: ID (73–76)	Seq. No. (77–80)
MSCP	1551
MSCP	1552
MSCF	1553
MSCP	1554
MSCP	1555
MSCP	1556
MSCP	1557
MSCP	1558
MSCP	1559
MSCP	1550
MSCF	1561
MSCP	1562
MSCP	1563
MSCP	1564
MSCP	1585
MSCP	1586

Fig. B10 — Example of Form 23

FORM 24

PROBABILITY OF DETECTING BUT NOT PINPOINTING A TARGET

CARMONETTE IV

Sensor Class	Sensor Type	Card No.		Target Activity																	Identification	
				Not Moving								Movin									ID	Seq. No.
				Observer Activity																		
				Not Neutralized				Neutralized				Not Neutralized				Neutralized						
				Target Solid Angle Class																		
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4			
1	2	3	4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	37 38	39 40	41 42	43 44	45 46	47 48	49 50	51 52	53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72	73 74 75 76	77 78 79 80
1	1	2																				
1	2	2																				
1	3	2																				
1	4	2																				
1	5	2																				
1	6	2																				
2	1	2																				
2	2	2																				
2	3	2																				
2	4	2																				
2	5	2																				
4	6	2																				
5	1	2																				
5	2	2																				
5	3	2																				
5	4	2																				
5	5	2																				
5	6	2																				
6	1	2																				
6	2	2																				
6	3	2																				
6	4	2																				
6	5	2																				
6	6	2																				

ID	Seq. No.
MSCP	1587
MSCP	1588
MSCP	1589
MSCP	1590
MSCP	1591
MSCP	1592
MSCP	1593
MSCP	1594
MSCP	1595
MSCP	1596
MSCP	1597
MSCP	1598
MSCP	1599
MSCP	1600
MSCP	1601
MSCP	1602
MSCP	1603
MSCP	1604
MSCP	1618
MSCP	1619
MSCP	1620
MSCP	1621
MSCP	1622

Each entry in Form 24 must be greater than zero.

Target Solid Angle Class
1. $A < \alpha_1$ (from Form 22)
2. $\alpha_1 \le A < \alpha_2$ (from Form 22)
3. $\alpha_2 \le A < \alpha_3$ (from Form 22)
4. $A \ge \alpha_3$

Fig. B11 — Example of Form 24

FORM 25
PROBABILITY OF DETECTING AND PINPOINTING A TARFET

CARMONETTE IV

Sensor Class	Sensor Type	Card No.		Target Activity: Not Moving; Observer Activity: Not Neutralized; Target Solid Angle Class 1	2	3	4	Not Moving; Neutralized; 1	2	3	4	Moving; Not Neutralized; 1	2	3	4	Moving; Neutralized; 1	2	3	4		Identification: ID	Seq. No.
1	2	3	4–20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	37 38	39 40	41 42	43 44	45 46	47 48	49 50	51 52	53–72	73 74 75 76	77 78 79 80
1	1	3																			M S C P	1 6 2 3
1	2	3																			M S C P	1 6 2 4
1	3	3																			M S C P	1 6 2 5
1	4	3																			M S C P	1 6 2 6
1	5	3																			M S C P	1 6 2 7
1	6	3																			M S C P	1 6 2 8
2	1	3																			M S C P	1 6 2 9
2	2	3																			M S C P	1 6 3 0
3	6	3																			M S C P	1 6 3 1
4	1	3																			M S C P	1 6 3 2
4	2	3																			M S C P	1 6 3 3
4	3	3																			M S C P	1 6 3 4
4	4	3																			M S C P	1 6 3 5
4	5	3																			M S C P	1 6 3 6
4	6	3																			M S C P	1 6 3 7
5	1	3																				
5	2	3																			M S C P	1 6 4 8
5	3	3																			M S C P	1 6 4 9
5	4	3																			M S C P	1 6 5 0
5	5	3																			M S C P	1 6 5 1
5	6	3																			M S C P	1 6 5 2
6	1	3																			M S C P	1 6 5 3
6	2	3																			M S C P	1 6 5 4
6	3	3																			M S C P	1 6 5 5
6	4	3																			M S C P	1 6 5 6
6	5	3																			M S C P	1 6 5 7
6	6	3																			M S C P	1 6 5 8

Each entry in Form 25 must be greater than zero.

Target Solid Angle Class

1. $A < \alpha_1$ (from Form 22)
2. $\alpha_1 \le A < \alpha_2$ (from Form 22)
3. $\alpha_2 \le A < \alpha_3$ (from Form 22)
4. $A \ge \alpha_3$

Fig. B12 — Example of Form 25

FORM 26
PROBABILITY THAT A TARGET IS STILL PINPOINTED

CARMONETTE IV

Sensor Class (col. 1)	Sensor Type (col. 2)	Card No. (col. 3)	Target Activity: Not Moving — Observer Activity: Not Neutralized — Target Solid Angle Class 1 (cols. 21–22)	Not Moving — Not Neutralized — 2 (cols. 23–24)	Not Moving — Not Neutralized — 3 (cols. 25–26)	Not Moving — Not Neutralized — 4 (cols. 27–28)	Not Moving — Neutralized — 1 (cols. 29–30)	Not Moving — Neutralized — 2 (cols. 31–32)	Not Moving — Neutralized — 3 (cols. 33–34)	Not Moving — Neutralized — 4 (cols. 35–36)	Moving — Not Neutralized — 1 (cols. 37–38)	Moving — Not Neutralized — 2 (cols. 39–40)	Moving — Not Neutralized — 3 (cols. 41–42)	Moving — Not Neutralized — 4 (cols. 43–44)	Moving — Neutralized — 1 (cols. 45–46)	Moving — Neutralized — 2 (cols. 47–48)	Moving — Neutralized — 3 (cols. 49–50)	Moving — Neutralized — 4 (cols. 51–52)	Identification: ID (cols. 73–76)	Identification: Seq. No. (cols. 77–80)
1	1	4																	MSCP	1659
1	2	4																	MSCP	1660
1	3	4																	MSCP	1661
1	4	4																	MSCP	1662
1	5	4																	MSCP	1663
1	6	4																	MSCP	1664
2	1	4																	MSCP	1665
2	2	4																	MSCP	1666
2	3	4																	MSCP	1667
2	4	4																	MSCP	1668
2	5	4																	MSCP	1669
4	2	4																	MSCP	1670
4	3	4																	MSCP	1671
4	4	4																	MSCP	1672
4	5	4																	MSCP	1673
4	6	4																	MSCP	1674
5	1	4																	MSCP	1675
5	2	4																		
5	3	4																	MSCP	1685
5	4	4																	MSCP	1686
5	5	4																	MSCP	1687
5	6	4																	MSCP	1688
6	1	4																	MSCP	1689
6	2	4																	MSCP	1690
6	3	4																	MSCP	1691
6	4	4																	MSCP	1692
6	5	4																	MSCP	1693
6	6	4																	MSCP	1694

Each entry in Form 26 must be greater than zero.

Target Solid Angle Class

1. $A < \alpha_1$ (from Form 22)
2. $\alpha_1 \leq A < \alpha_2$ (from Form 22)
3. $\alpha_2 \leq A < \alpha_3$ (from Form 22)
4. $A \geq \alpha_3$

Fig. B13 — Example of Form 26

FORM 27
PROBABILITY THAT A TARGET WHICH HAS BEEN PINPOINTED IS LOST

CARMONETTE IV

Sensor Class	Sensor Type	Card No.		Target Activity																	Identification	
				Not Moving								Moving									ID	Seq. No.
				Observer Activity																		
				Not Neutralized				Neutralized				Not Neutralized				Neutralized						
				Target Solid Angle Class																		
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4			
1	2	3	4–20	21–22	23–24	25–26	27–28	29–30	31–32	33–34	35–36	37–38	39–40	41–42	43–44	45–46	47–48	49–50	51–52	53–72	73–76	77–80
1	1	5																			MSCP	1695
1	2	5																			MSCP	1696
1	3	5																			MSCP	1697
1	4	5																			MSCP	1698
1	5	5																			MSCP	1699
1	6	5																			MSCP	1700
2	1	5																			MSCP	1701
2	2	5																			MSCP	1702
2	3	5																			MSCP	1703
2	4	5																			MSCP	1704
4	3	5																			MSCP	1705
4	4	5																			MSCP	1706
4	5	5																			MSCP	1707
4	6	5																			MSCP	1708
5	1	5																			MSCP	1709
5	2	5																			MSCP	1710
5	3	5																			MSCP	1711
5	4	5																			MSCP	1721
5	5	5																			MSCP	1722
5	6	5																			MSCP	1723
6	1	5																			MSCP	1724
6	2	5																			MSCP	1725
6	3	5																			MSCP	1726
6	4	5																			MSCP	1727
6	5	5																			MSCP	1728
6	6	5																			MSCP	1729
																					MSCP	1730

Each sum of corresponding entries in Forms 26 and 27 must be less than one, but an entry in Form 27 may be zero.

Target Solid Angle Class
1. $A < \alpha_1$ (from Form 22)
2. $\alpha_1 \le A < \alpha_2$ (from Form 22)
3. $\alpha_2 \le A < \alpha_3$ (from Form 22)
4. $A \ge \alpha_3$

Fig. B14 — Example of Form 27

FORM 28
PROBABILITY THAT A DETECTED TARGET IS LOST

CARMONETTE IV

Sensor Class	Sensor Type	Card No.		Target Activity																	Identification	
				Not Moving								Moving									ID	Seq. No.
				Observer Activity																		
				Not Neutralized				Neutralized				Not Neutralized				Neutralized						
				Target Solid Angle Class																		
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4			
1	2	3	4–20	21–22	23–24	25–26	27–28	29–30	31–32	33–34	35–36	37–38	39–40	41–42	43–44	45–46	47–48	49–50	51–52	53–72	73–76	77–80
1	1	6																			M S C P	1 7 3 1
1	2	6																			M S C P	1 7 3 2
1	3	6																			M S C P	1 7 3 3
1	4	6																			M S C P	1 7 3 4
1	5	6																			M S C P	1 7 3 5
1	6	6																			M S C P	1 7 3 6
2	1	6																			M S C P	1 7 3 7
2	2	6																			M S C P	1 7 3 8
2	3	6																			M S C P	1 7 3 9
2	4	6																			M S C P	1 7 4 0
2	5	6																			M S C P	1 7 4 1
																					M S C P	1 7 4 2
																					M S C P	1 7 4 3
																					M S C P	1 7 4 4
																					M S C P	1 7 4 5
																					M S C P	1 7 4 6
																					M S C P	1 7 4 7
5	1	6																				
5	2	6																				
5	3	6																				
5	4	6																				
5	5	6																				
5	6	6																				
6	1	6																			M S C P	1 7 6 1
6	2	6																			M S C P	1 7 6 2
6	3	6																			M S C P	1 7 6 3
6	4	6																			M S C P	1 7 6 4
6	5	6																			M S C P	1 7 6 5
6	6	6																			M S C P	1 7 6 6

Each entry in Form 28 must be greater than zero and less than the corresponding entry in Form 24 divided by one minus the corresponding entry in Form 23.

Target Solid Angle Class

1. $A < \alpha_1$ (from Form 22)
2. $\alpha_1 \le A < \alpha_2$ (from Form 22)
3. $\alpha_2 \le A < \alpha_3$ (from Form 22)
4. $A \ge \alpha_3$

Fig. B15 — Example of Form 28

FORM 29
PROBABILITY OF DETECTING THAT A TARGET IS DEAD

CARMONETTE IV

1 2 3	Target Activity: Not Moving; Observer Activity: Not Neutralized; Target Solid Angle Class 1	2	3	4	Not Moving; Neutralized; 1	2	3	4	Moving; Not Neutralized; 1	2	3	4	Moving; Neutralized; 1	2	3	4	Identification: ID	Seq. No.
1 1 7																	M S C P	1 7 6 7
1 2 7																	M S C P	1 7 6 8
1 3 7																	M S C P	1 7 6 9
1 4 7																	M S C P	1 7 7 0
1 5 7																	M S C P	1 7 7 1
1 6 7																	M S C P	1 7 7 2
2 1 7																	M S C P	1 7 7 3
2 2 7																	M S C P	1 7 7 4
2 3 7																	M S C P	1 7 7 5
2 4 7																	M S C P	1 7 7 6
2 5 7																	M S C P	1 7 7 7
4 4 7																	M S C P	1 7 7 8
4 5 7																	M S C P	1 7 7 9
4 6 7																	M S C P	1 7 8 0
5 1 7																	M S C P	1 7 8 1
5 2 7																	M S C P	1 7 9 2
5 3 7																	M S C P	1 7 9 3
5 4 7																	M S C P	1 7 9 4
5 5 7																	M S C P	1 7 9 5
5 6 7																	M S C P	1 7 9 6
6 1 7																	M S C P	1 7 9 7
6 2 7																	M S C P	1 7 9 8
6 3 7																	M S C P	1 7 9 9
6 4 7																	M S C P	1 8 0 0
6 5 7																	M S C P	1 8 0 1
6 6 7																	M S C P	1 8 0 2

Target Solid Angle Class

1. $A < \alpha_1$ (from Form 22)
2. $\alpha_1 \le A < \alpha_2$ (from Form 22)
3. $\alpha_2 \le A < \alpha_3$ (from Form 22)
4. $A \ge \alpha_3$

Fig. B16 — Example of Form 29

FORMS 30 - 31 — INFORMATION PROBABILITIES ON FIRING TARGETS

Forms 30 and 31 have been reivsed to provide for only three solid angle classes. The order of the entries has been revised to conform to the order of the program indexing. The form has been expanded to provide for six sensor classes with up to six types in each class. Figures B17 and B18 show examples of Forms 30 and 31.

FORM 30

PROBABILITY OF ERRONEOUSLY PINPOINTING AN UNKNOWN TARGET THAT HAS FIRED

CARMONETTE IV

Sensor Class	Sensor Type	Card	Columns 4–22	Observer Activity: Neutralized — Target Solid Angle Class 1 (23–24)	2 (25–26)	3 (27–28)	4 (29–30)	Not Neutralized — Target Solid Angle Class 1 (31–32)	2 (33–34)	3 (35–36)	4 (37–38)	Columns 39–72
1	1	1										
1	2	1										
1	3	1										
1	4	1										
1	5	1										
1	6	1										
2	1	1										
2	2	1										
2	3	1										
2	4	1										
2	5	1										
2	6	1										
4	6	1										
5	1	1										
5	2	1										
5	3	1										
5	4	1										
5	5	1										
5	6	1										
6	1	1										
6	2	1										
6	3	1										
6	4	1										
6	5	1										
6	6	1										

Target Solid Angle Class

1. $A < B_1$ (from Form 22)
2. $B_1 \leq A < B_2$ (from Form 22)
3. $B_2 \leq A < B_3$ (from Form 22)
4. $A \geq B_3$ (from Form 22)

Identification: ID (73–76)	Seq No. (77–80)
UNTP	1803
UNTP	1804
UNTP	1805
UNTP	1806
UNTP	1807
UNTP	1808
UNTP	1809
UNTP	1810
UNTP	1811
UNTP	1812
UNTP	1813
UNTP	1814
UNTP	1815
UNTP	1816
UNTP	1817
UNTP	1830
UNTP	1831
UNTP	1832
UNTP	1833
UNTP	1834
UNTP	1835
UNTP	1836
UNTP	1837
UNTP	1838

Fig. B17 — Example of Form 30

FORM 31

PROBABILITY OF PINPOINTING A TARGET THAT HAS FIRED FROM ERRONEOUS PINPOINT INFORMATION

CARMONETTE IV

Sensor Class	Sensor Type	Card	Observer Activity: Neutralized — Target Solid Angle Class 1	2	3	4	Not Neutralized — Target Solid Angle Class 1	2	3	4
1	2	3	23 24	25 26	27 28	29 30	31 32	33 34	35 36	37 38
1	1	2								
1	2	2								
1	3	2								
1	4	2								
1	5	2								
1	6	2								
2	1	2								
2	2	2								
2	3	2								
4	2	2								
4	3	2								
4	4	2								
4	5	2								
4	6	2								
5	1	2								
5	2	2								
5	3	2								
5	4	2								
5	5	2								
5	6	2								
6	1	2								
6	2	2								
6	3	2								
6	4	2								
6	5	2								
6	6	2								

Identification

ID (73–76)	Seq. No. (77–80)
UNTP	1839
UNTP	1840
UNTP	1841
UNTP	1842
UNTP	1843
UNTP	1844
UNTP	1845
UNTP	1846
UNTP	1847
UNTP	1848
UNTP	1849
UNTP	1850
UNTP	1851
UNTP	1852
UNTP	1853
UNTP	1854
UNTP	1855
UNTP	1856
UNTP	1868
UNTP	1869
UNTP	1870
UNTP	1871
UNTP	1872
UNTP	1873
UNTP	1874

Target Solid Angle Class

1. $A < \beta_1$ (from Form 22)
2. $\beta_1 \leq A < \beta_2$ (from Form 22)
3. $\beta_2 \leq A < \beta_3$ (from Form 22)
4. $A \geq \beta_3$ (from Form 22)

Fig. B18 — Example of Form 31

FORM 36 - COMMAND AND CONTROL UNITS

Form 36— Command and Control Units (Blue and Red) is provided for the inputs of the required information concerning the CCS units.

A superior headquarters must be listed in columns 4 and 5 for each CCSU listed. For the superior headquarters being played in the game enter its own number.

In columns 6 through 21 a maximum of six CCS units that are subordinate to the CCS unit shown on that line can be entered. If the unit concerned does not have any subordinate units, i.e., forward observers or radar teams, no entry is required.

In columns 22 through 33 a maximum of eight subordinate weapons units can be listed. If the CCS unit concerned does not have any subordinate weapon units of its own some other unit(s) should be listed to provide for continued life for the CCS unit if its original buddy unit should be killed.

In columns 34 and 35 a weapon unit is listed as the buddy unit for the CCS unit. The CCS unit will have the same initial position, follow the same orders, and move with the buddy unit listed. The buddy unit will normally be one of the subordinate weapon units of the CCS unit; however; if the CCS unit does not have any subordinate weapon units of its own, a weapon unit is selected to be its buddy unit. The same weapon unit can serve as the buddy unit for more than one CCS unit. These CCS units will then move together.

Columns 36 through 43 provide for the entry of sensor class, sensor type, and sensor height (in meters) for two different sensors.

Columns 44 to 46 are for the entry of the length of the communication cycle (in hundredths of a minute) for the CCS unit concerned. An X is entered in column 47 if the CCS unit is to have the capability of calling artillery fire.

Provision is made for an entry in column 48 to indicate authority to call helicopters to attack targets.

In columns 49 through 60 for artillery and columns 61 through 72 for helicopter, entries are made for the priority of targets against which these weapons will be called. The priorities for artillery and helicopters do not need to be the same.

Figure B19 shows an example of Form 36.

FORM 36

COMMAND AND CONTROL UNITS

CARMONETTE V

Side	Unit No.	Superior HQ	Subordinate CCS Units 1	2	3	4	5	6	Subordinate Weapon Units 1	2	3	4	5	6	7	8	Buddy Unit	Sensor 1 Class	Sensor 1 Type	Sensor 1 Height	Sensor 2 Class	Sensor 2 Type	Sensor 2 Height	Communication Cycle	X Call Arty	X Call Helo	Artillery Call Priorities, Target Class Preference 1	2	3	4	5	6	Helicopter Call Priorities, Target Class Preference 1	2	3	4	5	6	Identification ID	Seq. No.
1	2 3	4 5	6 7	8 9	10 11	12 13	14 15	16 17	18 19	20 21	22 23	24 25	26 27	28 29	30 31	32 33	34 35	36	37	38 39	40	41	42 43	44 45 46	47	48	49 50	51 52	53 54	55 56	57 58	59 60	61 62	63 64	65 66	67 68	69 70	71 72	73 74 75 76	77 78 79 80
BLUE																																								
1																																							C C S U	1 8 7 5
1																																							C C S U	1 8 7 6
																																							C C S U	1 8 7 7
																																							C C S U	1 8 7 8
1																																							C C S U	1 8 7 9
1																																							C C S U	1 8 8 0
1																																							C C S U	1 8 8 1
1																																								
1																																								
1																																							C C S U	1 8 8 7
1																																							C C S U	1 8 8 8
1																																							C C S U	1 8 8 9
RED																																								
2																																							C C S U	1 9 0 1
2																																							C C S U	1 9 0 2
																																							C C S U	1 9 0 3
																																							C C S U	1 9 0 4
2																																							C C S U	1 9 0 5
2																																							C C S U	1 9 0 6
2																																								
2																																							C C S U	1 9 1 1
2																																							C C S U	1 9 1 2
2																																							C C S U	1 9 1 3
2																																							C C S U	1 9 1 4
2																																							C C S U	1 9 1 5

Fig. B19 - Form 36— Command and Control Units

FORM 37 — IMAGE INTENSIFIER DATA

Forms 37A and 37B — Image Intensifier Data, are used to input the characteristics of the image intensifier class of the passive night vision devices used in the game. These data are critical to the probability of detection routine and calculations discussed in App A.

The entries in columns 18 through 50 of Form 37A are the values of the ordinate of the curve of the system modulation transfrer function at selected values of γ along the abscissa of the curve for the type device concerned. Figure A3 in App A shows the curves used in the night vision games. The values of γ_0 to γ_{10} against which the ordinate values are determined must be eleven equally spaced values along the abscissa. In the current project values of 0 to 4 in steps of 0.4 are used.

The entries in columns 3 to 8, 15 to 17, and 51 to 62 do not at present enter into the calculation routine and are provided for possible future refinement of the routine.

The entries in columns 7 to 72 of Form 37B are the ordinate values of the curve of the photocathode tube sensitivity at selected points along the abscissa of the curve. Figure A4 in App A shows the curve used in the night vision games. The values of λ_0 to λ_{10} must be eleven equally spaced values along the abscissa. The values used in the present project were 0.4 to 0.9 in steps of 0.05. These same values for λ_0 to λ_{10} are used for determining the entries in Forms 38 and 39 for background and target reflectance.

Figures B20 and B21 show examples of Forms 37A and 37B.

FORM 37A
IMAGE INTENSIFIER DATA

CARMONETTE IV

Sensor Class (1)	Sensor Type (2)	Field of View deg (3–5)	Magnification (6–8)	Objective F Number (9–11)	Objective Focal Length mm, F_0 (12–14)	Maximum Angular Spatial Freq, c/m rad (15–17)	Ordinates of System Modulation Transfer Function, T(y): y_0 (18–20)	y_1 (21–23)	y_2 (24–26)	y_3 (27–29)	y_4 (30–32)	y_5 (33–35)	y_6 (36–38)	y_7 (39–41)	y_8 (42–44)	y_9 (45–47)	y_{10} (48–50)	Photo Cathode Type (51–54)	Lower Limit of Detection Wave length, microns (55–57)	Upper Limit of Detection, Wave length, microns (58–60)	X Surveillance Mode (61)	X Target Acq Mode (62)	Device Transmission (63–64)	(65–72)	ID Name (73–76)	Seq. No. (77–80)
2	1																								PNV1	1501
2	2																								PNV1	1502
2	3																								PNV1	1503
2	4																								PNV1	1504
2	5																								PNV1	1505
2	6																								PNV1	1506
2	7																								PNV1	1507

Fig. B20 — Example of Form 37A

FORM 37B

Sensor Class (1)	Sensor Type (2)	Photocathode Type (3–6)	Ordinates of Photo cathode Sensitivity, Amps/Watt (Q(λ)): y_0 (7–12)	y_1 (13–18)	y_2 (19–24)	y_3 (25–30)	y_4 (31–36)	y_5 (37–42)	y_6 (43–48)	y_7 (49–54)	y_8 (55–60)	y_9 (61–66)	y_{10} (67–72)	ID Name (73–76)	Seq. No. (77–80)
2	1		E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	PNV2	1508
2	2		E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	PNV2	1509
2	3		E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	PNV2	1510
2	4		E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	PNV2	1511
2	5		E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	PNV2	1512
2	6		E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	PNV2	1513
2	7		E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	E–	PNV2	1514

Fig. B21 — Example of Form 37B

FORMS 38 and 39 – BACKGROUND AND TARGET REFLECTANCE

Form 38 – Background, and Form 39 – Target, are used for the entries of the spectral reflectance of the types of background and of targets being played in the game. The values of λ_o to λ_{10} on each form at which the reflectance values are entered must be the same as the equivalent values used in preparing Form 37B. The data used in the present project are shown in Tables A2 and A3 in App A.

On Form 38 the background numbers in columns 1 and 2 are equated to the values of the concealment index for the grid square as established in the preparation of the terrain inputs for the game (see Step 5, App A, Vol II, RAC-R-28, CARMONETTE III Documentation). A determination must be made as to the type of background, i.e. sand, loam, grass, bushes, etc. to be related to the concealment indexes used.

On Form 39 the target types are identified in columns 1 and 2 and are the same as the target class numbers entered in columns 4 and 5 of Form 4.

FORM 38
BACKGROUND

CARMONETTE IV

Background Number	Wavelength, Microns and Background Reflectance, Percent																						ID Name	Seq. No.
	λ_0	%	λ_1	%	λ_2	%	λ_3	%	λ_4	%	λ_5	%	λ_6	%	λ_7	%	λ_8	%	λ_9	%	λ_{10}	%			
1 2	3 4 5	6 7	8 9 10	11 12	13 14 15	16 17	18 19 20	21 22	23 24 25	26 27	28 29 30	31 32	33 34 35	36 37	38 39 40	41 42	43 44 45	46 47	48 49 50	51 52	53 54 55	56 57	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72	73 74 75 76	77 78 79 80
0 1																								B K V 1	1 5 1 5
0 2																								B K V 1	1 5 1 6
0 3																								B K V 1	1 5 1 7
0 4																								B K V 1	1 5 1 8
0 5																								B K V 1	1 5 1 9
0 6																								B K V 1	1 5 2 0
0 7																								B K V 1	1 5 2 1
0 8																								B K V 1	1 5 2 2
0 9																								B K V 1	1 5 2 3
1 0																								B K V 1	1 5 2 4
1 1																								B K V 1	1 5 2 5
1 2																								B K V 1	1 5 2 6
1 3																								B K V 1	1 5 2 7
1 4																								B K V 1	1 5 2 8
1 5																								B K V 1	1 5 2 9
1 6																								B K V 1	1 5 3 0

Values for λ_0 to λ_{10} must be the same as the values of λ used as entry points on Form 37 for Photocathode $Q(\lambda)$

Fig. B22 — Example of Form 38

FORM 39
TARGET

CARMONETTE IV

	Target Size			Wavelength, Microns and Target Reflectance, Percent																							ID Name	Seq. No.
	Length Meters	Width Meters	Height Meters	λ_0	%	λ_1	%	λ_2	%	λ_3	%	λ_4	%	λ_5	%	λ_6	%	λ_7	%	λ_8	%	λ_9	%	λ_{10}	%			
1 2	3 4 5 6	7 8 9	10 11 12	13 14 15	16 17	18 19 20	21 22	23 24 25	26 27	28 29 30	31 32	33 34 35	36 37	38 39 40	41 42	43 44 45	46 47	48 49 50	51 52	53 54 55	56 57	58 59 60	61 62	63 64 65	66 67	68 69 70 71 72	73 74 75 76	77 78 79 80
0 1																											T G V 1	1 5 3 2
0 2																											T G V 1	1 5 3 3
0 3																											T G V 1	1 5 3 4
0 4																											T G V 1	1 5 3 5
0 5																											T G V 1	1 5 3 6
0 6																											T G V 1	1 5 3 7
0 7																											T G V 1	1 5 3 8
0 8																											T G V 1	1 5 3 9
0 9																											T G V 1	1 5 4 0
1 0																											T G V 1	1 5 4 1
1 1																											T G V 1	1 5 4 2
1 2																											T G V 1	1 5 4 3
1 3																											T G V 1	1 5 4 4
1 4																											T G V 1	1 5 4 5
1 5																											T G V 1	1 5 4 6
1 6																											T G V 1	1 5 4 7

Values for λ_0 to λ_{10} must be the same as the values of λ used as entry points on Form 37 for Photocathode $Q(\lambda)$

Fig. B23 — Example of Form 39

FORM 40 — ENVIRONMENTAL DATA

Form 40 is used for the entry of the scattering and absorption coefficients associated with the different light levels. The radar degradation factors are also entered on this form.

This form could be easily expanded to include other types of environmental conditions such as fog, dust, smoke, rain, and similar conditions. Such an expansion would require changes in the present programming.

FORM 41 — RADAR CHARACTERISTICS

Form 41 is used for entry of the pertinent factors of radar performance that are used in the Radar Detection Routine.

FORM 40
ENVIRONMENTAL DATA

CARMONETTE IV

	Conditions	Visible Light Attenuation Coefficients: Scattering (σ_s)	Visible Light Attenuation Coefficients: Absorption (σ_a)	Radar Degradation Factor		ID Name	Seq. No.
1–2	3–11	12–18	19–25	26–28	29–72	73–76	77–80
11	STARLIGHT	E–	E–	.		COND	1548
12	PART MOON	E–	E–	.		COND	1549
13	MOONLIGHT	E–	E–	.		COND	1550

Fig. B24 — Example of Form 40

FORM 41
RADAR CHARACTERISTICS

CARMONETTE IV

Sensor Class	Sensor Type	Threshold Target Velocity (m/sec)	Maximum Range (m): Personnel	Maximum Range (m): Vehicles		ID Name	Seq. No.
1	2	3–6	7–10	11–15	16–72	73–76	77–80
		.				RADR	1927
		.				RADR	1928
		.				RADR	1929
		.				RADR	1930
		.				RADR	1931
		.				RADR	1932

Fig. B25 — Example of Form 41

Annex B2

EXAMPLE OF INPUTS

This annex is a listing of the computer inputs for one of the COBRA games, Treatment 4301. It is included to provide a potential user of the CARMONETTE simulation with examples of the kinds of numbers that are entered on the various input forms. To be understood it must be read in conjunction with the CARMONETTE input forms as described in the various volumes of documentation.

The form titles included here for information must not be included in a real game input deck.

FORM 1 WEAPON CHARACTERISTICS

CARD
INST4301

																				WPN1	
		100																		WPN1	385
81mm	01	100	3650	3	25	05	25	05	20	05	20	05	72	300	100	0	HEX		16	WPN1	386
4.2-in.	02	500	5500	3	25	05	25	05	20	05	20	05	120	300	100		HEX		16	WPN1	387
120mm	03	460	5700	3	25	05	25	05	20	05	20	05	88	300	100	0	HEX		17	WPN1	388
155mm	04	50018000		3	25	05	25	05	20	05	20	05	88	300	300	0	ICMX	HEX	17	WPN1	389
122mm	05	50011800		3	25	05	25	05	20	05	20	05	88	300	300	0	ICMX	HEX	17	WPN1	390
122mm	06	50015300		3	25	05	25	05	20	05	20	05	88	300	300	0	ICMX	HEX	17	WPN1	391
203mm	07	50016800		3	25	05	25	05	20	05	20	05	77	300	300	0	ICMX	HEX	17	WPN1	392
105mm	09	0	3000	1	25006		23	05	20	05	10002		1500			30	APDS	HEATX	16	WPN1	394
115mm	10	0	3000	1	20004		27	06	20	05	10	02	1500			30	HVAP	HEATX	16	WPN1	395
152mm M	111000		3000	1	17004		30	07	10	03	30006		210			30XX	HEAT	HEATX	16	WPN1	396
152mm C	12	0	1000	1	17004		27	05	10	03	27006		560			30	HEAT	HHEX	16	WPN1	397
76mm SM	13	0	3000	1	25	06	25	05	20	05	15	03	700			30	HEAT	HHEX	13	WPN1	398
76mm RR	14	15	1000	2	12	03	16	04	20	05	10	02	335			30	HEAT	HEX	13	WPN1	399
115mm	15	0	3000	1	20004		27	06	20	05	10	02	1500			30X	APDS		16	WPN1	400 vs Heptr
57/2	16	0	4000	6	11	02	08	02	05	01	03	01	400			12X	HEX	AP	16	WPN1	401
23/4	17	0	3300	4	11	02	08	02	05	01	03	01	400			12X	HEX	AP	17	WPN1	402
30mm	18	100	3000	1	05	01	02	00	04	01	02	00	250			10	HEXHVAT		63	WPN1	403
Rifle	19	0	460	1	05	01	05	01	04	01	04	01	660			01	BALL		21	WPN1	404
.50 APC	20	0	1500	1	16704		08302		10	03	04	01	400			02	BALL		62	WPN1	405
LMG	21	0	1100	1	16704		08302		10	03	04	01	450			02	BALL		61	WPN1	406
SAG Gnd	22	150	2500	1	12	03	08	02	10	02	30002		190			20XX	HEAT		15	WPN1	407
LAW	23	25	750	1	12	03	16704		10	02	10	02	356			05	HEAT		12	WPN1	408
RPG	24	25	500	1	12	03	16704		10	03	10	02	170			05	HEAT		12	WPN1	409
14.5 Tk	25	0	1500	1	16704		08302		10	03	04	01	450			03	AP		62	WPN1	410
STELLA	26	0	500	1	17	02	17	02	05	01	03	01	300			05XX	HE		11	WPN1	411
14.5/4	27	0	1500	5	08	02	08	02	05	01	03	01	450			08X	AP		401	WPN1	412
TOW Gnd	28	66	3000	2	12	03	40	09	10	03	33	07	233			20XX	HEAT		16	WPN1	413
DRAGON	29	66	1000	1	12	03	22	05	10	03	30	05	89			15XX	HEAT		14	WPN1	414
SAG-APC	30	150	2500	1	12	03	08	02	10	02100		02	190			20XX	HEAT		15	WPN1	415
SAG BRDM	31	150	2500	1	12	03	08	02	10	02	10	02	190			20XX	HEAT		15	WPN1	416
TOW CHR	32	66	3000	1	06	01	04	01	04	01	02	00	233			20XX	HEAT		16	WPN1	417
7.62 Tk	33	0	1100	1	16704		08302		10	03	04	01	450			02	BALL		61	WPN1	418
LMG APC	34	0	1100	1	16704		08302		10	03	04	01	450			02	BALL		61	WPN1	419
.50 Tk	35	0	1500	1	16704		08302		10	03	04	01	400			02	BALL		62	WPN1	420
.50 TOW/ APC	36	0	1500	1	16704		08302		10	03	04	01	400			02	BALL		62	WPN1	421

FORM 2 WEAPON ACCURACY --STANDARD DEVIATIONS

																								WPNE	
91	17	30	21	35	31	58	35	64	13	14	16	17	31	58	35	64	20	30	24	35	31	58	35	64E	777
92	14	15	15	17	18	24	20	26	10	11	11	12	18	24	20	26	14	19	17	22	18	24	20	26E	778
93	5	5	6	6	5	4	6	6	5	5	6	6	5	4	6	6	5	5	6	6	5	4	6	6E	779
101	33	63	37	69	42	70	50	77	16	16	18	18	42	70	50	77	37	33	40	38	42	70	50	77E	780
102	18	55	20	64	20	60	24	66	12	13	14	15	20	60	24	66	22	22	24	26	20	60	24	66E	781
103	5	2	6	10	4	2	8	9	5	6	6	7	4	8	8	9	5	5	6	7	4	8	8	9E	782
111	7	80	8	100	8	85	9	100	7	14	8	17	8	85	9	19	7	40	8	49	8	85	9	85E	783
112	7	63	8	78	7	76	8	78	7	12	8	14	7	76	8	16	7	31	8	16	7	76	8	76E	784
113	7	10	7	29	7	25	7	29	7	7	7	8	7	25	7	7	7	9	7	12	7	25	7	25E	785
121	23	23	29	29	29	29	30	30	9	9	12	12	29	29	30	30	15	15	16	16	29	29	30	30E	786
122	13	13	20	20	22	22	24	24	8	8	10	10	22	22	24	24	11	11	12	12	22	22	24	24E	787
123	6	6	6	6	6	6	6	6	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6E	788
131	76	76	114	114	80	80	120	120	18	18	27	27	20	20	30	30	46	46	69	69	50	50	75	75E	789
132	70	70	105	105	75	75	112	112	16	16	24	24	18	18	27	27	27	30	30	45	35	35	52	52E	790
133	10	10	15	15	10	10	15	15	9	9	13	13	10	10	15	15	10	10	15	15	20	20	30	30E	791
141	58	58	82	82	60	60	90	90	23	23	35	35	30	30	45	45	32	32	48	48	35	35	52	52E	792
142	27	27	40	40	30	30	45	45	18	18	27	27	22	22	33	33	21	21	31	31	25	25	37	37E	793
143	7	7	11	11	8	8	12	12	7	7	11	11	8	8	12	12	7	7	11	11	9	9	13	13E	794
151	10		10		10		10		10		10		10		10		10		10		10		10	E	795
152	55		55		55		55		55		55		55		55		55		55		55		55	E	796
153	4		4		4		4		4		4		4		4		4		4		4		4	E	797
161	77	77	100	100	77	77	100	100	77	77	100	100	77	77	100	100	77	77	100	100	77	77	100	100E	798
162	55	55	80	80	55	55	80	80	55	55	80	80	55	55	80	80	55	55	80	80	55	55	80	80E	799
163	04	04	05	05	04	04	05	05	04	04	05	05	04	04	05	05	04	04	05	05	04	04	05	05E	800
171	58	58	90	90	58	58	90	90	58	58	90	90	58	58	90	90	58	58	90	90	58	58	90	90E	801
172	30	30	50	50	30	30	50	50	30	30	50	50	30	30	50	50	30	30	50	50	30	30	50	50E	802
173	03	03	05	05	03	03	05	05	03	03	05	05	03	03	05	05	03	03	05	05	03	03	05	05E	803
181	80	80	80	80	80	80	80	80	70	70	70	70	70	70	70	70	100	100	100	100	100	100	100	100E	804
182	60	60	60	60	60	60	60	60	50	50	50	50	50	50	50	50	80	80	80	80	80	80	80	80E	805
183	10	10	10	10	10	10	10	10	8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10E	806
191	8		12		9		14		8		12		9		14		8		12		9		14	E	807
192	5		8		6		10		5		8		6		10		5		8		6		10	E	808
193	3		4		4		6		3		4		4		6		3		4		4		6	E	809

Form 2 continued

201	70	90	70	90	34	50	38	55	36	50	40	60	E 810
202	50	70	50	70	22	30	28	35	25	38	30	45	E 811
203	20	25	20	25	8	10	10	12	10	12	10	12	E 812
211	45	60	50	70	30	40	30	40	20	30	30	40	E 813
212	31	40	35	45	20	30	25	35	10	15	20	30	E 814
213	20	25	25	30	5	7	5	7	4	6	4	6	E 815
221	8	12	8	12	8	12	8	12	8	12	8	12	E 816
222	8	12	8	12	8	12	8	12	8	12	8	12	E 817
223	15	19	15	19	15	19	15	19	15	19	15	19	E 818
231	50	75	60	90	30	45	30	45	50	75	60	90	E 819
232	23	40	33	50	17	22	20	30	17	22	20	30	E 820
233	10	12	10	12	10	12	10	12	10	12	10	12	E 821
241	50	75	60	90	30	45	30	45	50	75	60	90	E 822
242	23	40	33	50	17	22	20	30	17	22	20	30	E 823
243	10	12	10	12	10	12	10	12	10	12	10	12	E 824
251	70	90	70	90	34	40	38	45	36	42	40	50	E 825
252	50	60	50	60	22	30	28	36	25	32	30	35	E 826
253	20	25	20	25	8	10	10	12	10	12	10	12	E 827
261	17	34	17	34	17	34	17	34	17	34	17	34	E 828
262	17	34	17	34	17	34	17	34	17	34	17	34	E 829
263	10	20	10	20	10	20	10	20	10	20	10	20	E 830
271400400400400400400400400400400400400400400400400400400400400400400400400E 831													
272280280280280280280280280280280280280280280280280280280280280280280280280E 832													
273 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10E 833													
281	7	10	7	10	7	10	7	10	7	10	7	10	E 834
282	7	10	7	10	7	10	7	10	7	10	7	10	E 835
283	7	10	7	10	7	10	7	10	7	10	7	10	E 836
291	8	12	8	12	8	12	8	12	8	12	8	12	E 837
292	8	12	9	13	8	12	9	13	8	12	9	13	E 838
293	8	12	9	13	8	12	9	13	8	12	9	13	E 839
301	8	12	8	12	8	12	8	12	8	12	8	12	E 840
302	8	12	8	12	8	12	8	12	8	12	8	12	E 841
303	15	19	15	19	15	19	15	19	15	19	15	19	E 842

Form 2 continued

311	8	12	8	12	8	12	8	12	8	12	8	12	E	843
312	8	12	8	12	8	12	8	12	8	12	8	12	E	844
313	15	19	15	19	15	19	15	19	15	19	15	19	E	845
321	9	10	10	10	9	10	10	10	9	10	10	10	E	846
322	8	9	9	9	8	9	9	9	8	9	9	9	E	847
323	7	8	7	8	7	8	7	8	7	8	7	8	E	848
331	45	50	50	50	30	34	30	30	20	25	30	30	E	849
332	31	40	35	35	20	28	25	25	10	15	20	20	E	850
333	20	25	25	25	5	5	5	5	4	5	4	5	E	851
341	45	50	50	60	30	34	30	34	20	25	30	34	E	852
342	31	40	35	45	20	28	25	30	10	15	20	25	E	853
343	20	25	25	30	5	7	5	7	4	6	4	6	E	854
351	70	70	70	70	34	36	38	40	36	38	40	40	E	855
352	50	50	50	50	22	25	28	30	25	28	30	30	E	856
353	20	20	20	20	8	10	10	12	10	12	10	10	E	857
361	70	90	70	90	34	36	38	45	36	40	40	45	E	858
362	50	60	50	60	22	30	28	35	25	30	30	40	E	859
363	20	25	20	25	8	10	10	12	10	12	10	12	E	860

FORM 3 ORDER OF BATTLE

```
                                                                                     UNT2
           2000  2000                                                                UNT2 422
APC        BC120 12000                                     10 1 1   13   2X   X      UNT2 423
Sqd        BC221 13000   23 2   8    19 6 840               9     6000   2           UNT2 424
DRAGON     BC329 1  12                                      1 1 1   50   2           UNT2 425
           BC420 12000                                     10 1 1   13   2X   X      UNT2 426
           BC521 13000   23 2   8    19 6 840               9     6000   2           UNT2 427
           B0629 1  12                                      1 1 1   50   2           UNT2 428
           B0720 12000                                     10 1 1   13   2X   X      UNT2 429
           B0821 13000   23 2   8    19 6 840               9     6000   2           UNT2 430
           B0929 1  12                                      1 1 1   50   2           UNT2 431
           B1020 12000                                     10 1 1   13   2X   X      UNT2 432
           B1121 13000   23 2   8    19 6 840               9     6000   2           UNT2 433
           B1229 1  12                                      1 1 1   50   2           UNT2 434
           B1320 12000                                     10 1 1   13   2X   X      UNT2 435
           B1421 13000   23 2   8    19 6 840               9     6000   2           UNT2 436
           B1529 1  12                                      1 1 1   50   2           UNT2 437
           B1620 12000                                     10 1 1   13   2X   X      UNT2 438
           B1721 13000   23 2   8    19 6 840               9     6000   2           UNT2 439
           B1829 1  12                                      1 1 1   50   2           UNT2 440
TOW/APC    B1928 1  10   036 12000  0                       4 1 1   13   2           UNT2 441
           B2028 1  10   036 12000  0                       4 1 1   13   2           UNT2 442
           B2128 1  10   036 12000  0                       4 1 1   13   2           UNT2 443
           B2228 1  10   036 12000  0                       4 1 1   13   2           UNT2 444
Tank       B2309 1  23  2335 1 500 40033 14095              2 1 2   29   3          XUNT2 445
           B2409 1  23  2335 1 500 40033 14095              2 1 2   29   3          XUNT2 446
           B2509 1  23  2335 1 500 40033 14095   0          2 1 2   29   3          XLNT2 447
           B2609 1  23  2335 1 500 40033 14095   0          2 1 2   29   3          XUNT2 448
           B2709 1  23  2335 1 500 40033 14095   0          2 1 2   29   3          XUNT2 449
           B2809 1  23  2335 1 500 40033 14095              2 1 2   29   3          XUNT2 450
           B2909 1  23  2335 1 500 40033 14095              2 1 2   29   3          XLNT2 451
           B3009 1  23  2335 1 500 40033 14095   0          2 1 2   29   3          XUNT2 452
           B3109 1  23  2335 1 500 40033 14095   0          2 1 2   29   3          XUNT2 453
           B3209 1  23  2335 1 500 40033 14095   0          2 1 2   29   3          XUNT2 454
81 Plt     B3301 3 465   020 42145143023 4. 24   019101400  027 4 4  700   2           UNT2 455
```

Form 3 continued

```
4.2 Plt  B3402 4 652    020  4409535281915210O     0        33  5  5  1350   2        UNT2 456
155 Btry B3504 61080 72020 7220514701925350O       0        40  7  7  4500   2        UNT2 457
         B3604 61080 72020 7220514701925350O       0        40  7  7  4500   2        UNT2 458
         B3704 61080 72020 7220514701925350O       0        40  7  7  4500   2        UNT2 459
203 Btry B3807 4 960  24019202800    0                      40  5  5  4000   2        UNT2 460
Tank     B3909 1  23   2335 1 500 40033  14095               2  1  2    29   3       XUNT2 461
         B4009 1  23   2335 1 500 40033  14095               2  1  2    29   3       XUNT2 462
         B4109 1  23   2335 1 500 40033  14095               2  1  2    29   3       XUNT2 463
         B4209 1  23   2335 1 500 40033  14095               2  1  2    29   3       XUNT2 464
         B4309 1  23   2335 1 500 40033  14095               2  1  2    29   3       XUNT2 465
COBRA    B4432 1  12     18 1 250 250                        2  1  2    12   1        UNT2 466
         B4532 1  12     18 1 250 250                        2  1  2    12   1        UNT2 467
         B4632 1  12     18 1 250 250                        2  1  2    12   1        UNT2 468
         B4732 1  12     18 1 250 250                        2  1  2    12   1        UNT2 469
APC      R0130 1   4    013 1  15   1234 11000     0        11  1  3    19   2X   X   UNT2 471
 Squad   R0221 22800    024 1   4    019  5 600           0  8  0  0  1200   1        UNT2 472
         R0330 1   4    013 1  15   1234 11000     0        11  1  3    19   2X   X   UNT2 473
         R0421 22800    024 1   4    019  5 600           0  8  0  0  1200   1        UNT2 474
         R0530 1   4    013 1  15   1234 11000     0        11  1  3    19   2X   X   UNT2 475
         R0621 22800    024 1   4    019  5 600           0  8  0  0  1200   1        UNT2 476
         R0730 1   4    013 1  15   1234 11000     0        11  1  3    19   2X   X   UNT2 477
         R0821 22800    024 1   4    019  5 600           0  8  0  0  1200   1        UNT2 478
         R0930 1   4    013 1  15   1234 11000     0        11  1  3    19   2X   X   UNT2 479
         R1021 22800    024 1   4    019  5 600           0  8  0  0  1200   1        UNT2 480
         R1130 1   4    013 1  15   1234 11000     0        11  1  3    19   2X   X   UNT2 481
         R1221 22800    024 1   4    019  5 600           0  8  0  0  1200   1        UNT2 482
         R1330 1   4    013 1  15   1234 11000     0        11  1  3    19   2X   X   UNT2 483
         R1421 22800    024 1   4    019  5 600           0  8  0  0  1200   1        UNT2 484
         R1530 1   4    013 1  15   1234 11000     0        11  1  3    19   2X   X   UNT2 485
         R1621 22800    024 1   4    019,5 600            0  8  0  0  1200   1        UNT2 486
         R1730 1   4    013 1  15   1234 11000     0        11  1  3    19   2X   Y   UNT2 487
         R1821 22800    024 1   4    019  5 600           0  8  0  0  1200   1        UNT2 488
```

Form 3 continued

```
Tank      R2010 1  25   1515 1  10    25 11200    33 11200    2 1 1   22   3     XUNT2 490
          R1910 1  25   1515 1  10    25 11200    33 11200    2 1 1   22   3     XUNT2 489
          R2110 1  25   1515 1  10    25 11200    33 11200    2 1 1   22   3     XUNT2 491
120 Btry  R2203 6 480     019454095   0                      50 0 0 3375   1 X    UNT2 492
122 Btry  R2305 6 576  38419634095    0                      63 0 0 4500   1 X    UNT2 493
          R2405 6 576  38419634095    0                      63 0 0 4500   1 X    UNT2 494
          R2505 6 576  38419634095    0                      63 0 0 4500   1 X    UNT2 495
BRDM      R2631 1  12      024 1  18                          2 1 2   19   2      UNT2 496
SAG Gnd   R2722 1  12       19 2 360                          3 1 3   50   1      UNT2 497
76 RR     R2814 1  12       19 3 240                          5 1 5   50   1      UNT2 498
23/4      R2917 1 500 500                                     4 1 4   50   2      UNT2 499
23/4      R3017 1 500 500                                     4 1 4   50   2      UNT2 500
```

FORM 4 UNIT DESCRIPTIONS

```
                                                                  UNT4
                                       COBRA II  RED III          UNT4 495
 4730            7 5                                              UNT4 496
 B01 3 23135216   50                                              UNT4 497
 B02 6 450152     50                                              UNT4 498
 B03 4 361352     50                                              UNT4 499
 B04 3 23135216   50                                              UNT4 500
 B05 6 450152     50                                              UNT4 501
 B06 4 361352     50                                              UNT4 502
 B07 3 23135216   50                                              UNT4 503
 B08 6 450152     50                                              UNT4 504
 B09 4 361352     50                                              UNT4 505
 B10 3 23135216   51                                              UNT4 506
 B11 6 450152     51                                              UNT4 507
 B12 4 361352     51                                              UNT4 508
 B13 3 23135216   51                                              UNT4 509
 B14 6 450152     51
```

Form 4 continued

```
B15 4 361352      51                    UNT4 510
B16 3 23135216    51                    UNT4 511
B17 6 450152      51                    UNT4 512
B18 4 361352      51                    UNT4 513
B19020231352 6    52                    UNT4 514
B20020231352 6    52                    UNT4 515
B21020231352 6    52                    UNT4 516
B22020231352 6    52                    UNT4 517
B23130111452 4    53                    UNT4 518
B24130111452 4    53                    UNT4 518
B25130111452 4    53                    UNT4 520
B26130111452 4    53                    UNT4 521
B27130111452 4    53                    UNT4 522
B28130111452 4    54                    UNT4 523
B29130111452 4    54                    UNT4 524
B30130111452 4    54                    UNT4 525
B31130111452 4    54                    UNT4 526
B32130111452 4    54                    UNT4 527
B33120341352 7    49                    UNT4 528
B34120341352 7    49                    UNT4 529
B35120341352 8    49                    UNT4 530
B36120341352 8    49                    UNT4 531
B37120341352 8    49                    UNT4 532
B38120341352 8    49                    UNT4 533
B39130111452 4    54                    UNT4 534
B40130111452 4    54                    UNT4 535
B41130111452 4    54                    UNT4 536
B42130111452 4    54                    UNT4 537
B43130111452 4    54                    UNT4 538
B44 5 545553 2    53                    UNT4 539
B45 5 545553 2    53                    UNT4 540
```

Form 4 continued

```
B46 5 545553 2   55                UNT4 541
B47 5 545553 2   55                UNT4 542
R0108023235216   50                UNT4 544
R02110650151     50                UNT4 545
R0308023235216   50                UNT4 546
R04110650151     50                UNT4 547
R0508023235216   50                UNT4 548
R06110650151     50                UNT4 549
R0708023235216   51                UNT4 550
R08110650151     51                UNT4 551
R0908023235216   51                UNT4 552
R10110650151     51                UNT4 553
R1108023235216   51                UNT4 554
R12110650151     51                UNT4 555
R1308023235216   52                UNT4 556
R14110650151     52                UNT4 557
R1508023235216   52                UNT4 558
R16110650151     52                UNT4 559
R1708023235216   52                UNT4 560
R18110650151     52                UNT4 561
R19070121452 4   53                UNT4 562
R20070121452 4   53                UNT4 563
R21070121452 4   53                UNT4 564
R22120321352     49                UNT4 565
R23120321352     49                UNT4 566
R24120321352     49                UNT4 567
R25120321352     49                UNT4 568
R26090241352     53                UNT4 569
R27140361352     53                UNT4 570
R28100361352     53                UNT4 571
R2915 222354 4   49                UNT4 572
R3015 222354 4   49                UNT4 573
```

```
                    FORM  6  DANGER STATE TABLE
                                                                MCS7
    300 1500                                                    MCS7 628
01          SSSS SS      SSSS SS      SSSS SS                   MCS7 629
02          SSSS SS      SSSS SS      SSSS SS                   MCS7 630
03          ISSS SS      IMSS SM      IIII MI                   MCS7 631
04          SSSS SS      MMMM MM      IIII II                   MCS7 632
05          SSSS SS      SSSS SS      SSSS SS                   MCS7 633
06          MMMS SM      MMMM MI      IIII II                   MCS7 634
07          SSSSSSS      SSSSSSS      MMMMMMM                   MCS7 635
08          SSSSMSS      SSSSMSS      SSSMIMM                   MCS7 636
09          SSSSSSS      SSSSMSS      SSSSIMM                   MCS7 637
10          SSSSMSS      SSSSMSS      SSSSIMM                   MCS7 638
11          MMMSMSM      MMMMMMM      IIIIIII                   MCS7 639
12          SSSSMS       MSSSMS       IIIMMM                    MCS7 640
13          SSSS SS      SSSS SS      SSSS SS                   MCS7 641
14          SSSSSSS      SSSSMSS      SSSSISM                   MCS7 642
15          MSM S S      MMM S S      IMM S M                   MCS7 643
16          IIIISII      IIIIMIII     IIIIIII                   MCS7 644
                    FORM  7  THRESHOLDS FOR RESPONSE
                                                                SP26
   150                                                          SP26 682
B 210   48 126 210   56 140   64 168 100 210  14  14            SP26 683
R 210   48 126 210   56 140   64 168 100 210 180 150            SP26 684
```

FORM 8 TARGET PRIORITY LISTS

```
                                                    WPN2
B   200                                             WPN2 861
B09070809151411                                     WPN2 862
B11070809151411                                     WPN2 864
B12070809151411                                     WPN2 865
B18151608090714                                     WPN2 871
B1911101408090711101408090 7                        WPN2 872
B20080915111410                                     WPN2 873
B21111015080914                                     WPN2 874
B23070809151114                                     WPN2 876
B28070809151410                                     WPN2 881
B29070809151410                                     WPN2 882
B32071508091410                                     WPN2 885
B33141011080907141011080907                         WPN2 884
B35141011080907111410080907                         WPN2 885
B36141011080907111410080907                         WPN2 886
R10011302040306                                     WPN2 892
R13020304060113020304060113                         WPN2 895
R14020304060113020304060113                         WPN2 896
R1505                                               WPN2 897
R16050203040113                                     WPN2 898
R17050203040113                                     WPN2 899
R190604050302                                       WPN2 901
R210604050302                                       WPN2 903
R220113020304                                       WPN2 904
R24011302040306011302040306                         WPN2 906
R25050204030601                                     WPN2 907
R2605                                               WPN2 908
R27050204031301                                     WPN2 909
R300113020304                                       WPN2 912
R310113020304                                       WPN2 913
R34 4 6 2 5 3 1                                     WPN2 916
```

FORM 10 COVER--FORM 11 CONCEALMENT--FORM 12 NET COVER

```
                                                                              COV9
 1102 80 57 41 05 05 60 53 38 41 03 03333333                                  COV9 646
 2102 80 57 41 05 05 60 53 38 41 03 03333333                                  COV9 647
 3102 80 57 41 05 05 60 53 38 41 03 03333333                                  COV9 648
 4 83 57 53 41 04 05 45 40 29 41 02 02333222                                  COV9 649
 5 83 57 53 41 04 05 45 40 29 41 02 02333222                                  COV9 650
 6 83 57 53 41 04 05 45 40 29 41 02 02333222                                  COV9 651
 7 55 45 20 41 02 05 30 27 19 41 02 02222211                                  COV9 652
 8 55 45 20 41 02 05 30 27 19 41 02 02222211                                  COV9 653
 9 55 45 20 41 02 05 30 27 19 41 02 02222211                                  COV9 654
10 25 20 15 41 01 05 15 13 09 41 01 01111111                                  COV9 655
11 25 20 15 41 01 05 15 13 09 41 01 01111111                                  COV9 656
12 25 20 15 41 01 05 15 13 09 41 01 01111111                                  COV9 657
13 10 10 10 41 01 05 10 07 05 41 01 01111111                                  COV9 658
14 10 10 10 41 01 05 10 07 05 41 01 01111111                                  COV9 659
15 10 10 10 41 01 05 10 07 05 41 01 01111111                                  COV9 660
16 10 10 10 41 01 05 10 07 05 41 01 01111111                                  COV9 661
```

FORM 13 KILL PROBABILITIES AND PREFERED AMMUNITION

```
                                                                              WPN6
 111       X  X  X  X     X66X75X73X57X15X15                                  WPN6 568
 121                        54 59 57 57 15 15   X10X05X05                     WPN6 569
 211       X  X  X  X       51 59X99X99X80X80                                 WPN6 570
 221                      X99X99 99 99 80 80    X75X50X50                     WPN6 571
-311       X  X  X  X       51 99X99X99X80X80   X50X50X50                     WPN6 572
 321                      X70X99 99 99 80 80                                  WPN6 573
 411       X  X  X  X       99 99       99 99                                 WPN6 574
 421                      X99X99      X99X99                                  WPN6 575
 511                         X93         80 80 93X79X33                       WPN6 576
 521                          99                  20 10                       WPN6 577
 611                        99    99                                          WPN6 578
```

Form 13 continued

621				X	X	X	X		X99	X99	X99	X99							WPN6 579
711					X	X				X75			X60	X60					WPN6 580
721										96			60	60					WPN6 581
1211				X95	X95	X95	X95		89	99	33	41	99	99					WPN6 590
1221									73	89	41	41	99	99		99	99	99	WPN6 591
112				64	38	15	02			57	52	64	64	57					WPN6 592
212				99	58	63	40			99	96	99	99	99			15	15	WPN6 594
312	70	70	70	70			70			99	96	99	99	99	70	70	70	70	WPN6 596
412	70	70	70	70			80								70	70	80	80	WPN6 598
512	03	04	03	99			04	50	04			99	99		03	03	04	04	WPN6 600
612	70	70	70				80								70	70	80	80	WPN6 602
712				96		42	20					99	99						WPN6 604
1212				61	92	99	99			42	76	61	61	42			99	99	WPN6 614

FORM 14 FRAGMENTING AMMO KILL PROBABILITIES

	WPN8
11020303020405	WPN8 685
21020404040608	WPN8 687
31020303030405	WPN8 689
41020303040607003800300030	WPN8 691
42020303040607	WPN8 692
51020303040607003500240024	WPN8 693
52020303040607	WPN8 694
61020303040607003500240024	WPN8 695
62020303040607	WPN8 696
71020303060810001200100010	WPN8 697
72020303040810	WPN8 698
92020303040607	WPN8 702
102020303040607	WPN8 704
111020303040607	WPN8 705
121030404050608	WPN8 707
131020303030405	WPN8 709
132020303030405	WPN8 710
141020303030405	WPN8 711
161020202020202	WPN8 715
171020202020202	WPN8 717
181020202020202	WPN8 718

FORM 15 PROBABILITY OF INDICATING DEATH

	UNT8
90956565996590	UNT8 645

FORM 16 MCVEMENT DOCTRINES

```
                                                                  MOBP
   10100                                                          MOBP 920
 B0        99909925                                               MOBP 921
 B1        99809950                                               MOBP 922
 B2        99809950                                               MOBP 923
 B5        99999999                                               MOBP 926
 R0        99909925                                               MOBP 929
 R1        99709960                                               MOBP 930
 R2        99509925                                               MOBP 931
```

FORM 17 GROUND MOBILITY TABLE

```
                                                                  MOB2
01     7  15  60                       22  16  11  22  18  16     MOB2 662
11     7  20  60                  05   55  35  22  55  55  55     MOB2 663
21     7  20  50                  05   55  35  22  55  55  55     MOB2 664
31     7  20  50                   5   55  35  22  55  55  55     MOB2 665
02 22   16  11  22  18  16             22  16  11  22  18  16     MOB2 667
12 35   25  17  55  50  28             30  20  14  35  35  22     MOB2 668
22 35   25  17  55  50  28             30  20  14  35  35  22     MOB2 669
32 35   25  17  55  50  28             30  20  14  35  35  22     MOB2 670
03 22   16  11  22  18  16             22  16  11  22  16  11     MOB2 672
13 35   25  17  55  50  28             30  20  14  35  35  22     MOB2 673
23 35   25  17  55  50  28             30  20  14  35  35  22     MOB2 674
33 35   25  17  55  50  28             30  20  14  35  25  22     MOB2 675
```

FORM 18 AIRCRAFT ALTITUDE DATA

```
                                                                  MOB3
  505   05   05  400                                              MOB3 677
```

FORM 19 AIR MOBILITY TABLE

```
                                                                  MOB4
5  85  55  25  20  40  75      20   40   60   35   15             MOB4 678
```

```
                    FORM 20 ORDERED ALTITUDES

  20   50 150 600 900100                                                      MOB5
                                                                              MOB5 681
                    FORM 21 ORDERED MOVEMENT RATES

 20 20 20 25 30 35 45 25 5 10  20 35 50 30                                    MOBR
                                                                              MOBR 937
                    FORM 22 SCLID ANGLE THRESHOLDS

 5125 1001.00E-63.00E-62.00E-5     0 45002.45E-77.50E-75.32E-6 4500           SENS
 5225 1001.00E-63.00E-61.20E-5     0 50002.45E-77.50E-73.00E-6 5000           SENS 985
 5310  251.00E-63.00E-62.00E-5     0 50002.45E-77.50E-75.32E-6 5000           SENS 986
 5425  376.50E-72.00E-68.00E-6     0 50002.45E-77.50E-75.32E-6 5000           SENS 987
 5525  376.50E-72.00E-68.00E-6     0 50002.45E-77.50E-75.32E-6 5000           SENS 988
                                                                              SENS 989
              FORMS  23-28  DETECTION PROBABILITIES

 511                      97702002957025029464140294752002                    MSCP
 521                      93310802978866518631080294886651                    MSCP1575
 531        HCPT          87766866877668668755393587553935    P 11            MSCP1576
 541        ADA RADAR     17070402170704021707040217070402        P11         MSCP1577
 551       ADA VISUAL     87645350958970608731080294886651                    MSCP1578
 512                      02020202020202020202020202020202                    MSCP1579
 522                      02020202020202020202020202020202                    MSCP1611
 532                      02020202020202020202020202020202    P 12            MSCP1612
                                                                  P12         MSCF1613
```

Forms 23-28 continued

```
542          02020202020202020202020202020202                    MSCP1614
552          02020202020202020202020202020202                    MSCP1615
513          00042025000310150209405000052025   P14 C            MSCP1647
523          04324447000415251065889402083045   P 14             MSCP1648
533          10212931102129311042586210425862       P14          MSCP1649
543          80909395708090908090939570809090                    MSCP1650
553          10324447020820301065889402083045                    MSCP1651
514          50607075253035405065808525354050   P44 C            MSCP1683
524          90929698454648499092969845464849   P44 C            MSCP1684
534          90929698909296989092969890929698       P44          MSCP1685
544          90929698909296989092969890929698                    MSCP1686
554          90929698909296989092969890929698                    MSCP1687
515          00000000281209050000000028120905   P41 C            MSCP1719
525          00000000161209050000000016120905   P41 C            MSCP1720
535          00000000000000000000000000000000       P41          MSCP1721
545          00000000000000000000000000000000                    MSCP1722
555          00000000000000000000000000000000                    MSCP1723
516          30252015605040303020151060403020   P21 C            MSCP1755
526          02020202302519140202020230251914   P 21             MSCP1756
536          02020202020202020202020202020202    P21             MSCP1757
546          02020202151210070202020215121007                    MSCP1758
556          02020202302519140202020230251914                    MSCP1759

       FORM 29  PROBABILITY OF DETECTING THAT A TARGET IS DEAD

517          15203040101520301520304010152030                    MSCP1791
527          8085909560708090 0 0 0 0 0 0 0 0       PCEAD        MSCP1792
537          9595959580808090                                    MSCP1793
547          9999999999999999                                    MSCP1794
557          9999999999999999                                    MSCP1795
```

```
              FORM 30  PROBABILITY OF ERPP ON UNKNOWN FIRING TARGET

512                   4045505550607080                             UNTP1863
522                   4550556060707585                  PF34       UNTP1864
532                   6075859570859599                             UNTP1865
542                   6075859570859599                             UNTP1866
552                   6075859570859599                             UNTP1867

              FORM 31  PROBABILITY OF PP ON ERPP FIRING TARGET

                                                                   UNTP
511                   2030405030405060                             UNTP1827
521                   2030405030405060                  PF13       UNTP1828
531                   5070809060809095                             UNTP1829
541                   5070809060809095                             UNTP1830
551                   5070809060809095                             UNTP1831

                      FORM   32   ORDERS

                                                                   MISN
  1DISM                                                            MISN1001
  2STAY INTL   20 FIRE    1 KIND    4 PROR    1                    MISN1002
  3NSTP RATE    7 SQRE 3944 KIND    0 PROR    1                    MISN1003
  4MOVE DOCT    1 RATE    6 SQRE 3943 KIND    4 PROR    1          MISN1004
  5STAY INTL   20 FIRE    1 KIND    4 PROR    1                    MISN1005
  6SKIP FORW    2 ENUN    2 RNGE 1000                              MISN1006
  7SKIP BACK    2 UNCD                                             MISN1007
  8MOVE DOCT    1 RATE    6 SQRE 3942 KIND    4 PROR    1          MISN1008
  9STAY TIME 5000 FIRE    1 KIND    4 PROR    1                    MISN1009
 10STAY INTL   10                                                  MISN1010
 11SKIP BACK    2 UNCD                                             MISN1011
 13DISM                                                            MISN1013
 14STAY TIME   80 FIRE    0 KIND    0 PROR    1                    MISN1014
 15STAY TIME 5000 FIRE    3 KIND    4 PROR    4                    MISN1015
 16SKIP BACK    1 UNCD                                             MISN1016
```

Form 32 continued

```
19DISM                                                                    MISN1019
20STAY INTL   20 FIRE    1 KIND    4 PROR    1                            MISN1020
21NSTP RATE    7 SQRE 4044 KIND    0 PROR    1                            MISN1021
22MOVE DOCT    1 RATE    6 SQRE 4043 KIND    4 PROR    1                  MISN1022
23STAY INTL   20 FIRE    1 KIND    4 PROR    1                            MISN1023
24SKIP FORW    2 ENUN    2 RNGE 1000                                      MISN1024
25SKIP BACK    2 UNCD                                                     MISN1025
26MOVE DOCT    1 RATE    6 SQRE 4042 KIND    4 PROR    1                  MISN1026
27STAY TIME 5000 FIRE    1 KIND    4 PROR    1                            MISN1027
28STAY INTL   10                                                          MISN1028
29SKIP BACK    2 UNCD                                                     MISN1029
31DISM                                                                    MISN1031
32STAY INTL   20 FIRE    1 KIND    4 PROR    1                            MISN1032
33NSTP RATE    7 SQRE 4244 KIND    0 PROR    1                            MISN1033
34MOVE DOCT    1 RATE    6 SQRE 4243 KIND    4 PROR    1                  MISN1034
35STAY INTL   20 FIRE    1 KIND    4 PROR    1                            MISN1035
36SKIP FORW    2 ENUN    2 RNGE 1000                                      MISN1036
37SKIP BACK    2 UNCD                                                     MISN1037
38MOVE DOCT    1 RATE    6 SQRE 4242 KIND    4 PROR    1                  MISN1038
39STAY TIME 5000 FIRE    1 KIND    4 PROR    1                            MISN1039
40STAY INTL   10                                                          MISN1040
41SKIP BACK    2 UNCD                                                     MISN1041
43STAY TIME   10 FIRE    0 KIND    0 PROR    1                            MISN1043
44STAY TIME 5000 FIRE    1 KIND    4 PROR    1                            MISN1044
45STAY INTL    5                                                          MISN1045
46SKIP BACK    2 UNCD                                                     MISN1046
49STAY INTL   20 FIRE    1 KIND    4 PROR    1                            MISN1049
50NSTP RATE    7 SQRE 3744 KIND    0 PROR    1                            MISN1050
51MOVE DOCT    1 RATE    6 SQRE 3743 KIND    4 PROR    1                  MISN1051
52STAY INTL   20 FIRE    1 KIND    4 PROR    1                            MISN1052
53SKIP FORW    2 ENUN    2 RNGE 1000                                      MISN1053
54SKIP BACK    2 UNCD                                                     MISN1054
55MOVE DOCT    1 RATE    6 SQRE 3742 KIND    4 PROR    1                  MISN1055
56STAY TIME 5000 FIRE    1 KIND    4 PROR    1                            MISN1056
57STAY INTL   10                                                          MISN1057
58SKIP BACK    2 UNCD                                                     MISN1058
```

Form 32 continued

```
60STAY INTL   20 FIRE    1 KIND    4 PROR    1                                MISN1060
61NSTP RATE    7 SORE 3844 KIND    0 PROR    1                                MISN1061
62MOVE DOCT    1 RATE    6 SORE 3843 KIND    4 PROR    1                      MISN1062
63STAY INTL   20 FIRE    1 KIND    4 PROR    1                                MISN1063
64SKIP FORW    2 ENUN    2 RNGE 1000                                          MISN1064
65SKIP BACK    2 UNCD                                                         MISN1065
66MOVE DOCT    1 RATE    6 SORE 3842 KIND    4 PROR    1                      MISN1066
67STAY TIME 5000 FIRE    1 KIND    4 PROR    1                                MISN1067
68STAY INTL   10                                                              MISN1068
69SKIP BACK    2 UNCD                                                         MISN1069
71STAY TIME  100 FIRE    3 KIND    0 PROR    7                                MISN1071
72STAY INTL    5                                                              MISN1072
73SKIP BACK    2 TIME  100                                                    MISN1073
74STAY TIME 5000 FIRE    6 KIND    0 PROR    7                                MISN1074
75STAY INTL    5                                                              MISN1075
76SKIP BACK    2 TIME 5000                                                    MISN1076
79STAY TIME 5000 FIRE    1 KIND    4 PROR    1                                MISN1079
80STAY INTL   10                                                              MISN1080
81SKIP BACK    2 UNCD                                                         MISN1081
84STAY TIME   10 FIRE    0 KIND    0 PROR    1                                MISN1084
85STAY TIME 5000 FIRE    1 KIND    4 PROR    4                                MISN1085
86STAY INTL    5                                                              MISN1086
87SKIP BACK    2 UNCD                                                         MISN1087
90STAY TIME 5000 FIRE    1 KIND    4 PROR    1                                MISN1090
91SKIP BACK    1 UNCD                                                         MISN1091
99STAY INTL   20                                                              MISN1099
100NSTP RATE    6 SORE 4735 KIND    0 PROR    1                               MISN1100
101MOVE DOCT    1 RATE    6 SORE 4537 KIND    6 PROR    4                     MISN1101
102STAY INTL   10 FIRE    1 KIND    4 PROR    4                               MISN1102
103DISM                                                                       MISN1103
104STAY TIME 5000 FIRE    1 KIND    4 PROR    4                               MISN1104
105SKIP BACK    1 UNCD                                                        MISN1105
```

Form 32 continued

```
111STAY INTL   20                                                      MISN1111
112NSTP RATE    6 SQRE 4735 KIND    0 PROR    1                        MISN1112
113MOVE DOCT    1 RATE    6 SQRE 4537 KIND    6 PROR    4              MISN1113
114DISM                                                                MISN1114
115STAY INTL    2 FIRE    1 KIND    4 PROR    4                        MISN1115
116SKIP BACK    1 UNTL   26 SQRE 3133 SKP1                             MISN1116
117SKIP BACK    2 UNTL   27 SQRE 3133 SKP1                             MISN1117
118MOVE DOCT    1 RATE    6 SQRE 4240 KIND    6 PROR    4              MISN1118
119MOVE DOCT    1 RATE    7 SQRE 4141 KIND    6 PROR    4              MISN1119
120STAY TIME 5000 FIRE    5 KIND    4 PROR    4                        MISN1120
121SKIP BACK    1 UNCD                                                 MISN1121
124STAY INTL   20                                                      MISN1124
125NSTP RATE    6 SQRE 4537 KIND    0 PROR    1                        MISN1125
126STAY TIME 5000 FIRE    1 KIND    4 PROR    4                        MISN1126
127SKIP BACK    1 UNCD                                                 MISN1127
134STAY INTL   20                                                      MISN1134
135NSTP RATE    6 SQRE 4835 KIND    0 PROR    1                        [illegible]
[illegible]

[illegible]
139SKIP BACK    1 UNCD                                                 MISN1139
146STAY INTL   20                                                      MISN1146
147NSTP RATE    6 SQRE 4835 KIND    0 PROR    1                        MISN1147
148MOVE DOCT    1 RATE    6 SQRE 4637 KIND    6 PROR    4              MISN1148
149DISM                                                                MISN1149
150STAY INTL    2 FIRE    1 KIND    4 PROR    4                        MISN1150
151SKIP BACK    1 UNTL   26 SQRE 3133 SKP1                             MISN1151
152SKIP BACK    2 UNTL   27 SQRE 3133 SKP1                             MISN1152
153MOVE DOCT    1 RATE    6 SQRE 4340 KIND    6 PROR    4              MISN1153
154MOVE DOCT    1 RATE    7 SQRE 4241 KIND    4 PROR    4              MISN1154
155STAY TIME 5000 FIRE    5 KIND    4 PROR    4                        MISN1155
156SKIP BACK    1 UNCD                                                 MISN1156
159STAY INTL   20                                                      MISN1159
160NSTP RATE    6 SQRE 4637 KIND    0 PROR    1                        MISN1160
```

Form 32 continued

```
161STAY TIME 5000 FIRE     1 KIND    4 PROR     4                    MISN1161
162SKIP BACK    1 UNCD                                               MISN1162
170NSTP RATE    7 SQRE 4317 KIND    0 PROR     1                    MISN1170
171STAY TIME 5000 FIRE     1 KIND    4 PROR     1                    MISN1171
172STAY INTL   10                                                    MISN1172
173SKIP BACK    2 UNCD                                               MISN1173
176NSTP RATE    7 SQRE 4417 KIND    0 PROR     1                    MISN1176
177STAY TIME 5000 FIRE     1 KIND    4 PROR     1                    MISN1177
178STAY INTL   10                                                    MISN1178
179SKIP BACK    2 TIME 5000                                          MISN1179
182STAY TIME 5000 FIRE     3 KIND    0 PROR     7                    MISN1182
183STAY INTL    5                                                    MISN1183
184SKIP BACK    2 TIME 5000                                          MISN1184
187STAY FIRE    3 SQRE 4143 KIND    1 PROR     7                    MISN1187
188STAY INTL    5                                                    MISN1188
189SKIP BACK    2 TIME  170                                          MISN1189
190STAY FIRE    6 SQRE 4143 KIND    1 PROR     7                    MISN1190
191STAY INTL    5                                                    MISN1191
192SKIP BACK    2 TIME 5000                                          MISN1192
195STAY FIRE    3 SQRE 3943 KIND    1 PROR     7                    MISN1195
196STAY INTL    5                                                    MISN1196
197SKIP BACK    2 TIME  170                                          MISN1197
198STAY FIRE    6 SQRE 3943 KIND    1 PROR     7                    MISN1198
199STAY INTL    5                                                    MISN1199
200SKIP BACK    2 TIME 5000                                          MISN1200
203STAY FIRE    3 SQRE 3643 KIND    1 PROR     7                    MISN1203
204STAY INTL    5                                                    MISN1204
205SKIP BACK    2 TIME  170                                          MISN1205
206STAY FIRE    6 SQRE 3943 KIND    1 PROR     7                    MISN1206
207STAY INTL    5                                                    MISN1207
208SKIP BACK    2 TIME 5000                                          MISN1208
210NSTP RATE    7 SQRE 4020 KIND    6 PROR     1                    MISN1210
```

Form 32 continued

```
211NSTP RATE    7 SQRE 3624 KIND    6 PROR    1                MISN1211
212NSTP RATE    7 SQRE 3232 KIND    6 PROR    1                MISN1212
213STAY INTL   20 FIRE    1 KIND    4 PROR    1                MISN1213
214STAY INTL    2                                              MISN1214
215SKIP BACK    2 UNTL   26 SQRE 3133 SKP1                     MISN1215
216SKIP BACK    3 UNTL   27 SQRE 3133 SKP1                     MISN1216
217NSTP RATE    7 SQRE 3742 KIND    6 PROR    1                MISN1217
218STAY TIME 5000 FIRE    1 KIND    4 PROR    4                MISN1218
219SKIP BACK    1 UNCD                                         MISN1219
222STAY INTL    5                                              MISN1222
223NSTP RATE    7 SQRE 4020 KIND    6 PROR    1                MISN1223
224NSTP RATE    7 SQRE 3624 KIND    6 PROR    1                MISN1224
225STAY INTL   20 FIRE    1 KIND    4 PROR    1                MISN1225
226STAY INTL    2                                              MISN1226
227SKIP BACK    2 UNTL   23 SQRE 3232 SKP1                     MISN1227
228SKIP BACK    3 UNTL   24 SQRE 3232 SKP1                     MISN1228
229SKIP BACK    4 UNTL   25 SQRE 3232 SKP1                     MISN1229
230NSTP RATE    7 SQRE 3133 KIND    6 PROR    1                MISN1230
231NSTP RATE    7 SQRE 3642 KIND    6 PROR    1                MISN1231
232STAY TIME 5000 FIRE    1 KIND    4 PROR    4                MISN1232
233SKIP BACK    1 UNCD                                         MISN1233
250NSTP RATE    7 SQRE 4117 KIND    0 PROR    1                MISN1250
251STAY INTL   20 FIRE    1 KIND    4 PROR    1                MISN1251
252STAY INTL    2                                              MISN1252
253SKIP BACK    2 UNTL   31 SQRE 3724 SKP1                     MISN1253
254SKIP BACK    3 UNTL   32 SQRE 3724 SKP1                     MISN1254
255NSTP RATE    7 SQRE 3724 KIND    6 PROR    1                MISN1255
256STAY INTL   20 FIRE    1 KIND    4 PROR    1                MISN1256
257STAY INTL    2                                              MISN1257
258SKIP BACK    2 UNTL   31 SQRE 3830 SKP1                     MISN1258
259SKIP BACK    3 UNTL   32 SQRE 3830 SKP1                     MISN1259
260NSTP RATE    7 SQRE 3730 KIND    6 PROR    1                MISN1260
261NSTP RATE    7 SQRE 3841 KIND    6 PROR    1                MISN1261
262STAY TIME 5000 FIRE    1 KIND    4 PROR    4                MISN1262
263SKIP BACK    1 UNCD                                         MISN1263
266STAY INTL    5                                              MISN1266
```

Form 32 continued

```
267NSTP RATE     7 SQRE 4120 KIND    6 PROR     1                         MISN1267
268NSTP RATE     7 SQRE 3724 KIND    6 PROR     1                         MISN1268
269STAY INTL    20 FIRE    1 KIND    4 PROR     1                         MISN1269
270STAY INTL     2                                                        MISN1270
271SKIP BACK     2 UNTL   28 SQRE 3724 SKP1                               MISN1271
272SKIP BACK     3 UNTL   29 SQRE 3724 SKP1                               MISN1272
273SKIP BACK     4 UNTL   30 SQRE 3724 SKP1                               MISN1273
274NSTP RATE     7 SQRE 3830 KIND    6 PROR     1                         MISN1274
275STAY INTL     2 FIRE    1 KIND    4 PROR     1                         MISN1275
276SKIP BACK     2 UNTL   28 SQRE 3730 SKP1                               MISN1276
277SKIP BACK     3 UNTL   29 SQRE 3730 SKP1                               MISN1277
278SKIP BACK     4 UNTL   30 SQRE 3730 SKP1                               MISN1278
279NSTP RATE     7 SQRE 3942 KIND    6 PROR     1                         MISN1279
280STAY TIME  5000 FIRE    1 KIND    4 PROR     4                         MISN1280
281SKIP BACK     1 UNCD                                                   MISN1281
290NSTP RATE     7 SQRE 4217 KIND    6 PROR     1                         MISN1290
291NSTP RATE     7 SQRE 4425 KIND    6 PROR     1                         MISN1291
292STAY INTL    20 FIRE    1 KIND    4 PROR     1                         MISN1292
293STAY INTL     2                                                        MISN1293
294SKIP BACK     2 UNTL   41 SQRE 4324 SKP1                               MISN1294
295SKIP BACK     3 UNTL   42 SQRE 4324 SKP1                               MISN1295
296SKIP BACK     4 UNTL   43 SQRE 4324 SKP1                               MISN1296
297NSTP RATE     7 SQRE 4332 KIND    6 PROR     1                         MISN1297
298NSTP RATE     7 SQRE 4141 KIND    6 PROR     1                         MISN1298
299STAY TIME  5000 FIRE    1 KIND    4 PROR     4                         MISN1299
300SKIP BACK     1 UNCD                                                   MISN1300
310NSTP RATE     7 SQRE 4217 KIND    6 PROR     1                         MISN1310
311STAY INTL     2 FIRE    1 KIND    4 PROR     1                         MISN1311
312STAY INTL     2                                                        MISN1312
313SKIP BACK     2 UNTL   39 SQRE 4425 SKP1                               MISN1313
314SKIP BACK     3 UNTL   40 SQRE 4425 SKP1                               MISN1314
315NSTP RATE     7 SQRE 4232 KIND    6 PROR     1                         MISN1315
316NSTP RATE     7 SQRE 4041 KIND    6 PROR     1                         MISN1316
317STAY TIME  5000 FIRE    1 KIND    4 PROR     4                         MISN1317
318SKIP BACK     1 UNCD                                                   MISN1318
350STAY INTL    10                                                        MISN1350
```

Form 32 continued

```
351STAY TIME 5000                                                         MISN1351
352NSTP RATE    7 SORE 4106 KIND    0 PROR    0 ALT    1                  MISN1352
353NSTP RATE    7 SORE 3906 KIND    0 PROR    0 ALT    1                  MISN1353
354NSTP RATE    7 SORE 3015 KIND    0 PROR    0 ALT    1                  MISN1354
355CHAL LCS                                                               MISN1355
356STAY INTL    5 FIRE    1 KIND    4 PROR    1                           MISN1356
357NSTP RATE    7 SORE 2915 KIND    0 PROR    0 ALT    1                  MISN1357
358NSTP RATE    7 SORE 2916 KIND    0 PROR    0 ALT    1                  MISN1358
359STAY INTL    6                                                         MISN1359
360CHAL LCS                                                               MISN1360
361STAY INTL    5 FIRE    1 KIND    4 PROR    1                           MISN1361
362NSTP RATE    7 SORE 2817 KIND    0 PROR    0 ALT    1                  MISN1362
363NSTP RATE    7 SORE 2917 KIND    0 PROR    0 ALT    1                  MISN1363
364STAY INTL    6                                                         MISN1364
365CHAL LCS                                                               MISN1365
366STAY INTL    5 FIRE    1 KIND    4 PROR    1                           MISN1366
367NSTP RATE    7 SORE 2818 KIND    0 PROR    0 ALT    1                  MISN1367
368NSTP RATE    7 SORE 2918 KIND    0 PROR    0 ALT    1                  MISN1368
369STAY INTL    6                                                         MISN1369
370CHAL LCS                                                               MISN1370
371STAY INTL    5 FIRE    1 KIND    4 PROR    1                           MISN1371
372NSTP RATE    7 SORE 3906 KIND    0 PROR    0 ALT    1                  MISN1372
373NSTP RATE    7 SORE 4106 KIND    0 PROR    0 ALT    1                  MISN1373
374NSTP RATE    7 SORE 4409 KIND    0 PROR    0 ALT    1                  MISN1374
375CHAL LAND                                                              MISN1375
376STAY INTL   30                                                         MISN1376
377SKIP BACK   26 UNCD                                                    MISN1377
380STAY INTL   20                                                         MISN1380
381STAY TIME 5000                                                         MISN1381
382NSTP RATE    7 SORE 4609 KIND    0 PROR    0 ALT    1                  MISN1382
```

Form 32 continued

```
383NSTP RATE    7 SQRE 5417 KIND    0 PROR    0 ALT    1          MISN1383
384NSTP RATE    7 SQRE 5419 KIND    0 PROR    0 ALT    1          MISN1384
385NSTP RATE    7 SQRE 5320 KIND    0 PROR    0 ALT    1          MISN1385
386CHAL LCS                                                       MISN1386
387STAY INTL    5 FIRE    1 KIND    4 PROR    1                   MISN1387
388NSTP RATE    7 SQRE 5319 KIND    0 PROR    0 ALT    1          MISN1388
389NSTP RATE    7 SQRE 5220 KIND    0 PROR    0 ALT    1          MISN1389
390STAY INTL    6                                                 MISN1390
391CHAL LCS                                                       MISN1391
392STAY INTL    5 FIRE    1 KIND    4 PROR    1                   MISN1392
393NSTP RATE    7 SQRE 5221 KIND    0 PROR    0 ALT    1          MISN1393
394NSTP RATE    7 SQRE 5121 KIND    0 PROR    0 ALT    1          MISN1394
395STAY INTL    6                                                 MISN1395
396CHAL LCS                                                       MISN1396
397STAY INTL    5 FIRE    1 KIND    4 PROR    1                   MISN1397
398NSTP RATE    7 SQRE 4922 KIND    0 PROR    0 ALT    1          MISN1398
399NSTP RATE    7 SQRE 5022 KIND    0 PROR    0 ALT    1          MISN1399
400STAY INTL    6                                                 MISN1400
401CHAL LCS                                                       MISN1401
402STAY INTL    5 FIRE    1 KIND    4 PROR    1                   MISN1402
403NSTP RATE    7 SQRE 5419 KIND    0 PROR    0 ALT    1          MISN1403
404NSTP RATE    7 SQRE 5417 KIND    0 PROR    0 ALT    1          MISN1404
405NSTP RATE    7 SQRE 4609 KIND    0 PROR    0 ALT    1          MISN1405
406NSTP RATE    7 SQRE 4409 KIND    0 PROR    0 ALT    1          MISN1406
407CHAL LAND                                                      MISN1407
408STAY INTL   40                                                 MISN1408
409SKIP BACK   28 UNCD                                            MISN1409
```

```
                      FORM  33  FIRST ORDER AND STARTING LOCATION

B01 99471302111471303124471304 99471305111471306124471 3                    UNT7
B07 99471308111471309124471310134481311146481312159481 3                    UNT7 938
B131344813141464813151594813161344813171464813181594813                     UNT7 939
                                                                            UNT7 940
B191704313201704313211764413221764413232104013242104013                     UNT7 941
B252104013262234013272234013282504113292504113302504113                     UNT7 942
B312674113322674113331824308341824904351874201361954301                     UNT7 943
B372034401381824501392904213402904213413104213423104213                     UNT7 944
B4331042134435044094537644094638044094740844 09                             UNT7 945
R01  1394202 13394203  1394204 13394205  1394206 133942                     UNT7 946
R07 19404208 13404209 19404210 13404211 19404212 134042                     UNT7 947
R13 31424214 13424215 31424216 13424217 31424218 134242                     UNT7 948
R19 43414220 43414221 43414222 71405523 71386324 713963                     UNT7 949
R25 71406326 49374327 79394328 8441432909036433009042 43                    UNT7 950

                      FORM  34  OUT OF AMMUNITION ORDERS

                 EEEE                                                       SP18
                                                          E                 SP18 950
                      FORM  35  ESCAPE POINTS

13511240113460814048                MAP   C/E                               SP8A
                                                                            SP8A 951
```

FORM 36   COMMAND AND CCNTROL UNITS

```
                                                                            CCSU
14949505152535455013334353637380152 2      400X 111014 8 7                CCSU1875
15049              010407020503060901522      100X 111014 8 7                CCSU1876
15149              101316111412151810522      100X 111014 8 7                CCSU1877
15249              19202122         1952 2      100X 111014 8 7                CCSU1878
15349              232425262744454623523      100XX111014 8 7   7 8 91514   CCSU1879
15449              282930313245464728523      100XX111014 8 7   7 8 91514   CCSU1880
15549              394041424346474539523      100XX111014 8 7   7 8 91514   CCSU1881
2494950515253      222324252930     225201      400X  6 4 2 3 113               CCSU1901
25049              010305020406     015202      100X  6 4 2 3 113               CCSU1902
25149              070911081012     075202      100X  6 4 2 3 113               CCSU1903
25249              131517141618     135202      100X  6 4 2 3 113               CCSU1904
25349              192021262728     195202      100X  6 4 2 3 113               CCSU1905
                                                                            ENDP43C1
```

Annex B3

RUNNING GUIDE AND DATA STORAGE

RUNNING GUIDE AND DATA STORAGE

INTRODUCTION

This annex is written specifically for guidance of the user of the CARMONETTE V computer simulation. It replaces Appendix E, CARMONETTE IV documentation.

No changes were made in the CARMONETTE IV processing of CCS Units, Surveillance, Target Selection, Position Disclosure, and Call Artillery Subroutines which were changed from CARMONETTE III.

Dismount and Remount Subroutines were added. This permits the dismounting or remounting of units on or off ground or air vehicles.

A skip order was added to skip if a given number of friendly units of a given vulnerability class became casualties.

Multiple warhead ammunition was added to artillery for use against vehicles.

The battle area was increased from 36 by 63 squares to 60 by 63 squares. The number of weapons units for each side was increased from 36 to 48 and the number of CCS units decreased from 27 to 15. The maximum number of subordinate units of a command unit was changed to six CCS units and eight weapons units.

The output (history) from the battle model for the postprocessor was changed from 5-word to 500-word blocks.

A helicopter submodel was added to provide attack helicopter, reconnaissance, and troop carrier capabilities. The following five subroutines enable CARMONETTE to be played with helicopter tactics:

1. LS2TG — checks if LOS to the target(s) exists at maximum altitude.

2. CHGVRT— computes time for ordered altitude change.

3. MOVAIR— computes air movement time.

4. ADJUST— modifies air movement time for a diagonal move.

5. CLHCPR— selects attack helicopter unit to provide fire support which has been called by a command unit.

The inputs, outputs, and tape file numbers for the programs are as follows:

First Preprocessor

Input cards. See data preparation guide.

Tape 3. Output tape which is input to the second preprocessor. This tape will contain labeled commons CMAIN and INTER, whose lengths are stored in KONTRL (1) and (2), respectively, in BLOCK DATA STORE.

Tape 2. The tape 3 (output) from a previous first preprocessor run. It is used as input if the previous input is to be updated. If updating is not required for the father or all of the sons the CHGE card should be followed immediately by the END card.

The END card will suppress the printing of the treatment data to be suppressed. To obtain the printout an ENDP card should be used.

Second Preprocessor

Tape 3. The input tape. This is the output from the first preprocessor.

Tape 2. The output tape. This is the input for the Battle Model. It contains the labeled common CMAIN, the length of which is stored in NWPERM in BLOCK DATA BATTLE in the Battle Model, and in NWPERM in BLOCK DATA DEFINE in the second preprocessor.

Card input is a single run option card. A zero (0) in column 2 will suppress the printing of the diagnostic treatment data. A one (1)

will permit printing. Columns 4-5 is the number of backgrounds between 1 and 16. In CARMONETTE V this was always zero. If the printing of only one or more than one treatment is desired, the treatment number is entered in Columns 7-10.

The Battle Model

Tape 2. The input tape. This is the output from the second pre-processor.

Tape 4. The output tape. This tape contains the history event messages written during the running of the Battle Model.

Run Parameter Cards — The run parameters for each treatment are on separate cards. This card also controls the turning on of the debug feature. All numbers are decimal and right-adjusted in their fields.

Col 1-3 maximum minutes of battle time per replication.
Col 4-5 the number of replications to play.
Col 6-16 the seed for the first random number.
Col 17-20 treatment number to play.
Col 21-22 "X" coordinate on the battlefield.
Col 23-24 "Y" coordinate on the battlefield.
Col 25-28 a distance in meters.
Col 29 a side either 1-Blue or 2-Red.
Col 30 the number of units.

The last five fields above will cause the battle to terminate if more than the specified number of units of the given side reach the distance to the given square.

Col 31-34 the number of Red casualties to stop game.
Col 35-38 the number of Blue casualties to stop game.
Col 41-42 Indicator. In nonzero the debugging switch is turned on.
Col 44-47 beginning time for debugging printing.
Col 48-51 ending time for debugging printing.

In the last two fields above the numbers are scaled 2^6 and converted to decimal.

The last run parameter card must have the following:

Col 1-16 blank

Col 17-20 9999

Col 21-80 blank

The Postprocessor

Tape 4. The input tape. This is the history tape that was written during the battle simulation.

Input parameter cards. The first card contains a 1 in Col 1 if any history of any replication of any treatment is to be printed. A zero in Col 1 will print only a summary of all replications. Cols 2 to 5 contain the last treatment number to be processed. Cols 9 and 10 contain the replication number whose history is to be printed. A 99 entered in this field will cause the history of all replications to be printed. Columns 12 to 15 contain the treatment number whose replication(s) are to be printed. If this contains a zero (or blank) the history of the specified replication(s) of all treatments will be printed. If Cols 1 to 10 are nonzero, a second card with HISTRY in Cols 1 to 6 is required, otherwise the second card should be omitted.

The Range Interval Postprocessor

This program lists the number of engagements (firings), number of rounds fired, troop and vehicle casualties for each weapon on both sides, for all target classes that were engaged, in range intervals of a specified number of meters. Total accumulated casualties are then listed by range interval from the longest to the nearest range. The averages for all replications of the treatment follow. The listing is for each replication of each treatment.

Tape 4. The input tape. The history tape from the Battle Model.

Input card lists the last treatment number to be processed in Cols 2 to 5, the range interval desired in Cols 7 to 10.

After all inputs for the CARMONETTE programs have been determined to be satisfactory, the Battle Model and the Postprocessor can be run as a job stream in a single run to decrease turnaround time. The maximum number of magnetic tape will be two on the job card. The Battle Model binary tape is copied onto a disc file, and then the binary tape unloaded. The requests for tapes 2 and 4 follow. At the end of the Battle Model run tape 2 is unloaded and tape 4 rewound. Loading and running of the postprocessor binary tape is then requested. The field length should be varied to be kept at the minimum required using RFL cards.

The line count should be indicated when the binary tape for either preprocessor or postprocessor is loaded; example, BIN (LC=XXXXXX), where X is an octal number. Normally 60,000 for each treatment listed for each preprocessor is sufficient. For the postprocessor 100,000 lines for a 50-minute battle for each treatment is sufficient.

SERVICE ROUTINES

Subroutine RWTAPE

RWTAPE is a FORTRAN subroutine to handle binary tapes. It provides read, write, backspace, skip, write file mark, and rewind facilities. Calls to RWTAPE for a particular file should not be mixed with FORTRAN I/Ø on the same file. RWTAPE has six entry points which are explained below.

Call RBT. To read binary a logical record of N central memory words,

CALL RBT (fstloc, no. words, file no.)

where "fstloc" is the first location of a contiguous area that the data are to be read into, "no. words" is the number, N, of central memory words to be read, and "file no." is the number of one of the files that is defined on a REQUEST card and on the PROGRAM card. The file definitions

must be of the form TAPEx or TAPExx, where x is 1 to 9 and xx is 01 to 99. No other file definition will work. In all the calls, the number x or xx is substituted for the parameter "file no."

Call WBT. To write binary a logical record of N central memory words,

CALL WBT (fstloc, no. words, file no.)

where the parameters have a similar meaning to the above such that "fstloc" is the first location from which "no. words" will be written out onto "file no."

Call REPOS. To backspace the file N logical records,

CALL REPOS (dummy, no. logical, file no.)

where "dummy" is an unused but required parameter, "no. logical" is the number of logical records to be backspaced and "file no." is as before.

Call WFMK. To write a file mark:

CALL WFMK (dummy, dummy, file no.)

Call RWNDT. To rewind the file:

CALL RWNDT (dummy, dummy, file no.)

Call RBT. To skip one logical record:

CALL RBT (dummy, 0, file no.)

UTILITY ROUTINES

The following seven routines are coded in the CDC 6000 series machine language COMPASS and perform packing, bit setting, and bit testing operations.

All seven functions employ the same bit numbering convention. Bits are numbered from 1 to 60, counting the bits from right to left, as shown below.

60, 59, 58 ... 3, 2, 1

In all function calls, variable names have the following meanings:

Name	Description
IDATA	Location containing data to be modified, tested, etc.
NUM	A number specifying a contiguous number of bits (not to exceed 60)
NB	A bit number (1 to 60)
INSRT	Word containing a bit string to be inserted into another word.

I∅NBIT

I∅NBIT will set to one bit number NB of IDATA. A copy of the modified IDATA is returned to I.

I = I∅NBIT (IDATA, NB)

I∅FFBT

I∅FFBT will set to zero bit number NB of IDATA. A copy of the modified IDATA is returned to I.

I = I∅FFBT (IDATA, NB)

KBIT

KBIT will return the value true (a non-"plus zero" value) if bit number NB of IDATA is a one, and will return the value false (plus zero) otherwise. KBIT must be declared logical.

IF (KBIT (IDATA, NB))...statement....

IF (.NOT.KBIT (IDATA, NB)) will work only if the program was compiled by FORTRAN Extended.

NBITS

NBITS will return a count of the number of one bits in IDATA.

I = NBITS (IDATA)

KGET

KGET copies NUM bits of data starting at the NB^{th} bit position of IDATA and returns the copied bits right justified to I. IDATA is not modified.

I = KGET (IDATA, NUM, NB)

KPUT

KPUT inserts the rightmost NUM bits of INSRT into a copy of IDATA beginning with bit number NB. IDATA is not modified.

I = KPUT (IDATA, NUM, NB, INSRT)

IDATA

To modify IDATA, code as:

IDATA = KPUT (IDATA, NUM, NB, INSRT)

No error checking is performed by any of the functions, hence the user is responsible for proper use. Results will be unpredictable if either NUM or NB contains a parameter that exceeds 60. Further, unless the user specifically desires wrap-around from the high to low order part of the word, NUM should not exceed 61-NB.

DATA STORAGE ALLOCATION

Variable Words

Contents	Variable	Words
Game Control Data	JGAME	24
Terrain Characteristics	JLAND	2112
Mission Orders	JMISNS	999
Miscellaneous Data	JMISC	31
Line of Sight Info	JLØS	48
Side Parameters	JSIDEP	78,2
Unit Control Data	JCNTRL	11,48,2
Unit Attributes	JATRIB	48,2
Unit Characteristics	JUCHAR	10,48,2
Unit Intelligence	JINTEL	8,48,2
Command Control and Surveillance Unit Data	JCCS	6,15,2
Command Control and Surveillance Unit Characteristics	JCMD	7,15,2
Weapons Basic Data	JWEAP	3,36
Tactical Standard Deviations	JTACSD	12,28
Probabilities of Kill, Non-Frag Ammo	JPKILL	2,2,28
Probabilities of Kill, Frag Ammo	JFRAG	2,18
Target Detection Data	JDTECT	31,6,6
Cover and Concealment Conversion Data	JCNVRT	6,6
Ground Mobility Data	JGMØB	11,5
Air Mobility Data	JAMØB	5,3
Visual Devices, Detection Data	JVISA	6,2
Minimum Target Dimension	JDIM	3
I. I. Devices Magnification	JDMAG	1
Image Intensifier, Constant K1	CK1	6
Image Intensifier, Constant K2	CK2	6

Contents	Variable	Words
Image Intensifier Devices, Modulation Transfer Function	EDMTF	6
Image Intensifier Devices, Computed Integral Approximation	P2	6
Image Intensifier Devices, Background Reflectance	BREFM1	6,16
Image Intensifier Devices, Target Reflectance	TREFM2	6,16
Integral of Relative Luminosity, Night Sky Brightness	P1	3
Visual Devices, Background Reflectance	BREFM3	16
Visual Devices, Target Reflectance	TREFM4	16
Night Sky Brightness, Wavelengths .4 to .9	SBK	11
Radar Characteristics	JRADAR	6
Run Control Data	JRUN	14
Arty Target Priority	IARTY	6,15,2
Helo Target Priority	IHELØ	6,15,2
Special Data	JDATA	17
Visibility Condition Data	JDMAG	1

Game Control Data JGAME (24)

Twenty four words are used to control the game. Each is stored in a unique word for ease of control.

Description	6400 Local variable	6400 Word no.
Current Treatment No.	NTR	1
Current Event Command Unit	IFHQ	2
Current Time XXX$_\wedge$XXXX	KTIME	3
Current Event Side	MSIDE	4
Current Event Unit	MUNIT	5
Current Event Unit X coordinate	IXS	6
Current Event Unit Y coordinate	IYS	7
Current Event Unit Altitude	IZS	8
Current Event Code	KCØDE	9
Current Event Message Code	LØB	10
Current Weapon (Main, B, C, D)	MWB	11
Opposite Side (3- MSIDE)	IØPP	12
Current Random Number	NUMR	13
Meters per grid	MGRID	14
Number of Blue Weapon Units	JBLUE	15
Number of Red Weapon Units	JRED	16
Total Number of Enemy Weapon Units	ITNBR	17
Total Number of Blue Command Units	JCBLUE	18
Total Number of Red Command Units	JCRED	19
Total Number of Command Units	ICNBR	20
Current Number of Blue Casualties (men)	KASBLU	21
Current Number of Red Casualties (men)	KASRED	22
Current Event Sensor (A or B)	MSENS	23
Not used		24

Terrain Characteristics JLAND (2112)

A 60 by 63 terrain grid is represented with two grids per 6400 word in 2112 words.

Description	6400 Local variable	6400 Bit no.
Word 1 Grid X1, Y1 and X2, Y1		
Grid X1, Y1		
Elevation (0-4095 ft)	LELEV	60-49
Vegetation (0-63 ft)	LVEG	48-43
Road trafficability (0, 1, 2, 3)	LRØAD	42-41
Cross country trafficability (1, 2, 3)	LTRAF	40-39
Cover Index (0-15)	LCØV	38-35
Concealment index (0-15)	LCØN	34-31
Grid X2, Y1		
Elevation (0-4095 ft)	LELEV	30-19
Vegetation (0-63 ft)	LVEG	18-13
Road trafficability (0, 1, 2, 3)	LRØAD	12-11
Cross country trafficability (1, 2, 3)	LTRAF	10- 9
Cover index (0-15)	LCØV	8- 5
Concealment index (0-15)	LCØN	4- 1
. . .		
Word 30 Grid X59, Y1 and X60, Y1		
See Word 1 for format		
. . .		

Scenarios JMISNS (999)

A series of orders for each unit simulated is defined as the game scenario. Each unit has its next sequential order number stored in Word 10 of unit control data (JCNTRL). Each order defines its subsequent order either explicitly or conditionally. Any combination of units on either side may utilize the same sequence of orders. No provision exists for permitting a unit to follow a sequence and then diverge to follow a different sequence. (All units given the same initial order number must follow that same sequence.) (Input format limits the total number of orders to 999.)

Description	6400 Local variable	6400 Bit no.
Moving order mode	MWG	36-34
Moving order altitude	MWI	33-31
Moving order doctrine	MWJ	30-28
Moving order speed	MWK	27-25
Stay protect interval	MWSPI	33-25
Conditional order	MWR	24-22
Conditional order	MWB	21-19
X Coordinate	MWX	18-13
Y Coordinate	MWY	12- 7
Until battle time	MWTIME	18- 7
For battle interval	MWTIME	18- 7
Kind of fire	MWF1	6- 4
Priority of fire	MWF2	3- 1

Miscellaneous Data JMISC (31)

The following miscellaneous data are stored as follows:

Description		6400 Local variable	6400 Bit no.
Word 1 Ordered Moving Time Ground			
Ordered moving time, Rate 0	$3XX_{\wedge}XXXX$	LØMTG(1)	60-41
Ordered moving time, Rate 1	$3XX_{\wedge}XXXX$	LØMTG(2)	40-21
Ordered moving time, Rate 2	$3XX_{\wedge}XXXX$	LØMTG(3)	20- 1
Word 2 Ordered Moving Time Contd			
Ordered moving time, Rate 3	$3XX_{\wedge}XXXX$	LØMTG(4)	60-41
Ordered moving time, Rate 4	$3XX_{\wedge}XXXX$	LØMTG(5)	40-21
Ordered moving time, Rate 5	$3XX_{\wedge}XXXX$	LØMTG(6)	20- 1
Word 3 Ordered Moving Time Contd			
Ordered moving time, Rate 6	$3XX_{\wedge}XXXX$	LØMTG(7)	60-41
Not used			40- 1

JMISC continued

Description	6400 local variable	6400 bit no.
Word 4 Ordered Moving Time Air		
Ordered Moving Time, RATE 0	LØMTA(1)	60-41
Ordered Moving Time, RATE 1	LØMTA(2)	40-21
Ordered Moving Time, RATE 2	LØMTA(3)	20- 1
Word 5 Ordered Moving Time Air Contd		
Ordered Moving Time, RATE 3	LØMTA(4)	60-41
Ordered Moving Time, RATE 4	LØMTA(5)	40-21
Ordered Moving Time, RATE 5	LØMTA(6)	20- 1
Word 6 Ordered Moving Time Air Contd		
Ordered Moving Time, RATE 6	LØMTA(7)	60-41
Not used	LØMTA	40- 1
Word 7 Vulnerability Range Thresholds		
Near range threshold	KSVRN	60-49
Far range threshold	KSVRF	48-31
Not used		30- 1
Word 8 Vulnerability Class 1, Seriously Vulnerable		
Target Class 1, d ≤ R1	MCVTS(1,1)	1
Target Class 2, d ≤ R1	MCVTS(2,1)	2
Target Class 3, d ≤ R1	MCVTS(3,1)	3
Target Class 4, d ≤ R1	MCVTS(4,1)	4
Target Class 5, d ≤ R1	MCVTS(5,1)	5
Target Class 6, d ≤ R1	MCVTS(6,1)	6
Target Class 7, d ≤ R1	MCVTS(7,1)	7
Target Class 8, d ≤ R1	MCVTS(8,1)	8
Target Class 9, d ≤ R1	MCVTS(9,1)	9
Target Class 10,d ≤ R1	MCVTS(10,1)	10
Target Class 11,d ≤ R1	MCVTS(11,1)	11
Target Class 12,d ≤ R1	MCVTS(12,1)	12
Target Class 13,d ≤ R1	MCVTS(13,1)	13

JMISC continued

Description	6400 local variable	6400 bit no.
Word 8 continued		
Target Class 14, $d \le R1$	MCVTS(14,1)	14
Target Class 15, $d \le R1$	MCVTS(15,1)	15
Target Class 16, $d \le R1$	MCVTS(16,1)	16
Target Class 1, $R1 < d \le R2$	MCVTS(1,2)	17
Target Class 2, $R1 < d \le R2$	MCVTS(2,2)	18
Target Class 3, $R1 < d \le R2$	MCVTS(3,2)	19
Target Class 4, $R1 < d \le R2$	MCVTS(4,2)	20
Target Class 5, $R1 < d \le R2$	MCVTS(5,2)	21
Target Class 6, $R1 < d \le R2$	MCVTS(6,2)	22
Target Class 7, $R1 < d \le R2$	MCVTS(7,2)	23
Target Class 8, $R1 < d \le R2$	MCVTS(8,2)	24
Target Class 9, $R1 < d \le R2$	MCVTS(9,2)	25
Target Class 10, $R1 < d \le R2$	MCVTS(10,2)	26
Target Class 11, $R1 < d \le R2$	MCVTS(11,2)	27
Target Class 12, $R1 < d \le R2$	MCVTS(12,2)	28
Target Class 13, $R1 < d \le R2$	MCVTS(13,2)	29
Target Class 14, $R1 < d \le R2$	MCVTS(14,2)	30
Target Class 15, $R1 < d \le R2$	MCVTS(15,2)	31
Target Class 16, $R1 < d \le R2$	MCVTS(16,2)	32
Target Class 1, $d > R2$	MCVTS(1,3)	33
Target Class 2, $d > R2$	MCVTS(2,3)	34
Target Class 3, $d > R2$	MCVTS(3,3)	35
Target Class 4, $d > R2$	MCVTS(4,3)	36
Target Class 5, $d > R2$	MCVTS(5,3)	37
Target Class 6, $d > R2$	MCVTS(6,3)	38
Target Class 7, $d > R2$	MCVTS(7,3)	39
Target Class 8, $d > R2$	MCVTS(8,3)	40
Target Class 9, $d > R2$	MCVTS(9,3)	41
Target Class 10, $d > R2$	MCVTS(10,3)	42

JMISC continued

Description	6400 local variable	6400 bit no.
Word 8 continued		
Target Class 11, d > R2	MCVTS(11,3)	43
Target Class 12, d > R2	MCVTS(12,3)	44
Target Class 13, d > R2	MCVTS(13,3)	45
Target Class 14, d > R2	MCVTS(14,3)	46
Target Class 15, d > R2	MCVTS(15,3)	47
Target Class 16, d > R2	MCVTS(16,3)	48
Probability of Indicating Death when Killed	KBURN	60-55

Word 9 Vulnerability Class 2, Seriously Vulnerable

See Word 8 for format

. .
. .
. .

Word 19 Vulnerability Class 12, Seriously Vulnerable

. .
. .
. .

See Word 8 for format

Word 20 Vulnerability Class 1, Moderately Vulnerable

See Word 8 for format
(does not include KBURN)
MCTM(1,1)

. . .
. . .
. . .

Word 31 Vulnerability Class 12, Moderately Vulnerable

See Word 8 for format
(does not include KBURN)

.
.
.

MCVTM(16,3)

Line of Sight Information JLØS (48)

The line of sight information is contained in 48 words. The word number in the array corresponds to the Blue unit number. The bit number in each word corresponds to the Red unit number. A bit is on if the pair is intervisible. Bits 49-60 in each word are not used.

Side Parameters JSIDEP (78,2)

The side parameters consist of 78 words. The first four words contain the side's thresholds for response to enemy fire. The next word contains the "white eye" range and suppressive fire area for the side. The next word contains the exit points. The next 16 words contain the moving probabilities for each mobility class and movement doctrine. Fifty-six words describe the priority of targets for weapons assigned to the side.

Description	6400 local variable	6400 bit no.
Word 1 Infantry Thresholds		
Infantry pinned down, D.F. + Ind Fire	LLTF1	60-48
Infantry partially neut., D. Fire	LLTF2	47-36
Infantry partially neut., Ind Fire	LLTF3	35-24
Not used		23- 1
Word 2 Aircraft Thresholds		
Aircraft abort firing run	LLTHF	60-49
Aircraft drop to tree-top altitude	LLTHN	48-37
Not used		36- 1
Word 3 Armored Thresholds		
Light armored vehicles D. Fire	LLTM2	60-49
Light armored vehicles Ind Fire	LLTM2	48-37
Heavy armored vehicles D.Fire	LLTM3	36-25
Heavy armored vehicles Ind Fire	LLTM3	24-13
Not used		12- 1

JSIDEP continued

Description	6400 local variable	6400 bit no.
Word 4 Open Vehicles Thresholds		
Open vehicle pinned down	LLTZ1	60-48
Open vehicle partially neut., D. fire	LLTZ2	47-36
Open vehicle partially neut., Ind fire	LLTZ3	35-24
Not used		23- 1
Word 5 White Eye Range & Suppression Area		
White eye range	KWER	60-47
Suppressive fire search radius	LASQ	46-35
Not used		34- 1
Word 6 Escape Points		
X Coord of 1st Escape Point	LEXITX(1)	60-55
Y Coord of 1st Escape Point	LEXITY(1)	54-49
X Coord of 2nd Escape Point	LEXITX(2)	48-43
Y Coord of 2nd Escape Point	LEXITY(2)	42-37
X Coord of 3rd Escape Point	LEXITX(3)	36-31
Y Coord of 3rd Escape Point	LEXITY(3)	30-25
Not used		24- 1
Word 7 Moving Probabilities		
Mobility Class 0, Moving Doctrine 1		
No tgt No cover	LMVPRB(1)	60-55
Yes tgt No cover	LMVPRB(2)	54-49
No tgt Yes cover	LMVPRB(3)	48-43
Yes tgt Yes cover	LMVPRB(4)	42-37
Mobility Class 1, Moving Doctrine 2		
No tgt No cover	LMVPRB(1)	36-31
Yes tgt No cover	LMVPRB(2)	30-25
No tgt Yes cover	LMVPRB(3)	24-19
Yes tgt Yes cover	LMVPRB(4)	18-13
Not used		12- 1

Description	6400 local variable	6400 bit no.
Word 8 Moving Probabilities continued		
Mobility Class 0, Moving Doctrines 3 and 4		
See Word 7 for format		
. . .		
Word 22 Moving Probabilities continued		
Mobility Class 7, Moving Doctrines 3 and 4		
See Word 7 for format		
Words 23 and 24 Weapon #9 Priority Lists		
Target Class 1st priority, 1st sought	NCT(1)	60-56
Target Class 1st priority, 2nd sought	NCT(2)	55-51
Target Class 1st priority, 3rd sought	NCT(3)	50-46
Target Class 1st priority, 4th sought	NCT(4)	45-41
Target Class 1st priority, 5th sought	NCT(5)	40-36
Target Class 1st priority, 6th sought	NCT(6)	35-31
Target Class 2nd priority, 1st sought	NCT(1)	30-26
Target Class 2nd priority, 2nd sought	NCT(2)	25-21
Target Class 2nd priority, 3rd sought	NCT(3)	20-16
Target Class 2nd priority, 4th sought	NCT(4)	15-11
Target Class 2nd priority, 5th sought	NCT(5)	10- 6
Target Class 2nd priority, 6th sought	NCT(6)	5- 1
Target Class 3rd priority, 1st sought	NCT(1)	60-56
Target Class 3rd priority, 2nd sought	NCT(2)	55-51
Target Class 3rd priority, 3rd sought	NCT(3)	50-46
Target Class 3rd priority, 4th sought	NCT(4)	45-41
Target Class 3rd priority, 5th sought	NCT(5)	40-36
Target Class 3rd priority, 6th sought	NCT(6)	35-31
Not used		30- 1
Words 25 and 26 Weapon #10 Priority Lists		
See Words 23 and 24 for format		
. . .		

Description	6400 local variable	6400 bit no.
Words 77 and 78 Weapon #36 Priority Lists		
See Words 23 and 24 for format		

Unit Control Data JCNTRL (11, 48 , 2)

Unit control information is stored in 11 words. One word contains the time and event that will occur next for this unit. (If the next event is boundary crossing, the rest of the word contains the altitude increment and movement time from the boundary to the center of the next square.) Six words contain the unit's clocks; one word contains the number of rounds received; one word contains the current order; and one word contains the unit's location and a pointer to the next order. The last word contains the number of firings of the main weapon until the next order change and line of sight to enemy weapon units.

Description		6400 local variable	6400 bit no.
Word 1 Next Event			
Not used			60-31
Time— boundary to center of square	$XXX_{\wedge}XXXX$	ITBC	30-10
Altitude change		na	9- 1
Word 2 Activities			
Control time	$XXX_{\wedge}XXXX$	LCCLK	60-40
Control code		LCCDE	39-31
Tactic time	$XXX_{\wedge}XXXX$	LTCLK	30-10
Tactic code		LTCDE	9- 1
Word 3 Surveillance Devices			
Surveillance #1 time	$XXX_{\wedge}XXXX$	LSCLK(1)	60-40
Surveillance #1 code		LSCDE(1)	39-31
Surveillance #2 time	$XXX_{\wedge}XXXX$	LSCLK(2)	30-10
Surveillance #2 code		LSCDE(2)	9- 1

JCNTRL continued

Description		6400 local variable	6400 bit no.
Word 4 Main Weapon			
Event time	XXX$_\wedge$XXXX	IWCLK(1)	60-40
Event code		IWCDE(1)	39-31
Loading time	XXX$_\wedge$XXXX	LLCLK(1)	30-10
Loading code		LLCDE(1)	9- 1
Word 5 Weapon B			
See Word 4 for format		IWCLK(2)	
Word 6 Weapon C			
See Word 4 for format		IWCLK(3)	
Word 7 Weapon D			
See Word 4 for format		IWCLK(4)	
Word 8 Fire Received			
Direct fire received interval D-2		LLRD3	60-51
Direct fire received interval D-1		LLRD2	50-41
Direct fire received interval D		LLRD1	40-31
Indirect fire received interval D-2		LLRA3	30-21
Indirect fire received interval D-1		LLRA2	20-11
Indirect fire received interval D		LLRA1	10- 1
Word 9 Current Order			
Skip order time		LPCT	60-49
Current order number		LTAG	48-37
Moving order mode		MWG	36-34
Moving order altitude		MWI	33-31
Moving order doctrine		MWJ	30-28
Moving order speed		MWK	27-25
Stay protect interval		MWSPI	33-25
Conditional order		MWR	24-22
X Coordinate		MWX	18-13
Y Coordinate		MWY	12- 7

JCNTRL continued

Description	6400 local variable	6400 bit no.
Word 9 continued		
Until battle time	MWTIME	18- 7
For battle interval	MWTIME	18- 7
Kind of fire	MWFI	6- 4
Priority of fire	MWF2	3- 1
Word 10 Location and Next Order		
Current X coordinate	IXS	60-55
Original X coordinate	na	54-49
Current Y coordinate	IYS	48-43
Original Y coordinate	na	42-37
Current altitude	IZS	36-25
Next (or last) X coordinate	IXNEW	24-19
Next (or last) Y coordinate	IYNEW	18-13
Next order number	LTAGK	12- 1
Word 11 Activities Record		
Remaining firings until order change	LSMCHK	60-49
Line of sight to enemy weapon units		48- 1

The following event codes are used in the control words:

Event	Decimal	Octal (9 bits)
Decision	0	000
Boundary crossing	8	010
End dismount	16	020
Surveillance	24 + MSENS#	03j (j=MSENS)
Change altitude	32	040
Communication	40	050
Target Selection	64 + MWP*	10i (i=MWP)
End aiming	72 + MWP	11i (i=MWP)
Impact	96 + MWP	14i (i=MWP)
Assessment	112 + MWP	16i (i=MWP)
End loading	192 + MWP	30i (i=MWP)

(Event codes continued)

Event	Decimal	Octal (9 bits)
Tactics	320	500
Out of ammo	328	510

#MSENS is assigned sensor group: Sensor A=1, Sensor B=2.
*MWP is assigned weapon group: Main = 1; B= 2; C=3; D=4.

Unit Attributes JATRIB (48, 2)

Unit attributes are stored in one word per unit. A bit is on if the unit has the attribute described.

Attribute	6400 local variable	6400 bit no.
Ammunition contingency orders	LAC1	1
Escape orders	LBUG	2
Call artillery	LKHQ	3
Infantry	INF	4
Troop carrier	.NOT. NTCU	5
Dismount troops when hit	LTØFF	6
Aircraft	LLAC	7
Unable to fire	LFIRE	8
Unable to move	LMØB	9
Unit can provide air support	LASPT	10
Unit is dead	LSDEAD	11
Unit is dismounting	LFDISM	12
Unit is moving	LFMOVE	13
Unit can provide artillery support	LSPT	14
Unit is busy (responding to fire)	LFR	15
Not used		16
Unit may not fire until "white eye range"	LEYE	17
Unit is pinned down	LFR1	18
Unit is partially neutralized DF	LFR2	19
Unit is partially neutralized indirect fire	LFR3	20
Unit is burning	LBURN	21
Unit has burned	LHBURN	22

JATRIB continued

Attribute	6400 local variable	6400 bit no.
Main weapon is aimed	KAIM	23
Main weapon has suppressive fire target	LTAREA	24
Main weapon is direct fire	KDF	25
Main weapon requires guidance	LGM	26
Weapon B is aimed	KAIM(2)	27
Weapon B has suppressive fire target	LTAREA(2)	28
Weapon B is direct fire	KDF(2)	29
Weapon B requires guidance	LGM(2)	30
Weapon C is aimed	KAIM(3)	31
Weapon C has suppressive fire target	LTAREA(3)	32
Weapon C is direct fire	KDF(3)	33
Weapon C requires guidance	LGM(3)	34
Weapon D is aimed	KAIM(4)	35
Weapon D has suppressive fire target	LTAREA(4)	36
Weapon D is direct fire	KDF(4)	37
Weapon D required guidance	LGM(4)	38
Unit is mounted	LIMBØ	39
Unit is an artillery support unit (i.e., does not exist as a separate entity	LART	40
Potential carrier	LPTC	41
Unit is on diagonal move	LDIAG	42
Present moving rate (m/sec) $X_{\Delta}XXX$	MVEL	60-43

Unit Characteristics JUCHAR (10, 48, 2)

Ten words are used to describe the unit characteristics. Two words contain unit classification data and eight words contain weapons data.

JUCHAR continued

Description	6400 local variable	6400 bit no.
Word 1 Unit descriptors		
Original number of men	LMAN	60-55
Current number of men	KMAN	54-49
Original number of vehicles	LVEH	48-43
Current number of vehicles	KVEH	42-37
Number of drivers	KMI	36-31
Max number of men/vehicle	MMPV	30-25
Unit sensor height	LTALL	24-19
Unit deployment radius	IRADU	18-13
Apparent radius for detection	LCØN1	12- 7
Apparent radius for hit	LCØV1	6- 1
Word 2 Unit descriptors continued		
Target class	LCT	60-55
Vulnerability class	LCV	54-49
Element size class	IRAD	48-43
Mobility class	LCM	42-37
Fire response class	IFRT	36-31
Sensor #1 class	LSC	30-28
Sensor #1 type	LST	27-25
Net cover index	LCØV2	24-19
Number of assigned weapon types	na	18-13
Superior unit number	MBØSS	12- 7
Fraction of time unavailable to provide support fire	LFTU	6- 1
Word 3 Main Weapon Description		
Weapon type	MWPT	60-55
Number of weapons	KTUBE	54-49
Target number	ITNØ	48-43
Target X coordinate	IXT	42-37
Target Y coordinate	IYT	36-31
Trigger pull pinpoint status (not used)	ITP	30-25

Description	6400 local variable	6400 bit no.
Word 3 continued		
Ammo type	IA	24-19
Hit signal	JHIT	18-13
Number of men firing	NMF	12- 7
Number of consecutive shots	NCS	6- 1
Word 4 Main Weapon Description continued		
Ammunition type 1 remaining	LAMW1	60-49
Ammunition type 1 originally	na	48-37
Ammunition type 2 remaining	LAMW2	36-25
Ammunition type 2 originally	na	24-13
Number of rounds fired at last target	LRNDS	12- 1
Word 5 Weapon B Description		
See Words 3 and 4 for format		
Word 6 Weapon B Description continued		
See Words 3 and 4 for format		
Word 7 Weapon C Description		
See Words 3 and 4 for format		
Word 8 Weapon C Description continued		
See Words 3 and 4 for format		
Word 9 Weapon D Description		
See Words 3 and 4 for format		
Word 10 Weapon D Description continued		
See Words 3 and 4 for format		

Unit Information JINTEL (8, 48, 2)

Unit information concerning all enemy units is stored in eight words. Within each word, six enemy units are represented with ten items of information represented by the bits. A bit is on if the unit has the item of information concerning the enemy unit.

Information	6400 local variable	6400 bit no.
Enemy unit known dead	LDEAD	1
Enemy unit detected (nearest square)	MI2	2
Enemy unit identified (erroneous pinpoint)	MI3	3
Enemy unit recognized (accurately pinpointed)	MI4	4
Enemy unit firing at other units interval D	LKEE1	5
Enemy unit firing at other units interval D-1	LKEE2	6
Enemy unit firing at other units interval D-2	LKEE3	7
Enemy unit firing at this unit interval D	LLEE1	8
Enemy unit firing at this unit interval D-1	LLEE2	9
Enemy unit firing at this unit interval D-2	LLEE3	10

	Enemy unit numbers					
Unit No. 1	60 - 51	50 - 41	40 - 31	30 - 21	20 - 11	10 - 1
Word 1	6	5	4	3	2	1
Word 2	12	11	10	9	8	7
Word 3	18	17	16	15	14	13
Word 4	24	23	22	21	20	19
Word 5	30	29	28	27	26	25
Word 6	36	35	34	33	32	31
Word 7	42	41	40	39	38	37
Word 8	48	47	46	45	44	43

Command, Control, and Surveillance Unit Data JCCS (6, 15, 2)

Six words are used to store the information for the command units. If the event is boundary crossing the rest of the word contains the time from boundary to center and the altitude increment. The next word contains the unit control clock and the tactics clock. The third word

JCCS continued

contains the surveillance clocks for the two surveillance devices permitted each CCS unit. The fourth word contains the communications clock. The last two words contain the current order and the location for the unit.

Description		6400 local variable	6400 bit no.
Word 1	Next event		
Master clock	XXX^XXXX	LMCLK	60-40
Master code		na	39-31
Time from boundary to center	XXX^XXXX	ITBC	30-10
Altitude increment		na	9- 1
Word 2	Activities		
Control time	XXX^XXXX	LCCLK	60-40
Control code		LCCDE	39-31
Tactic time	XXX^XXXX	LTCLK	30-10
Tactic code		LTCDE	9- 1
Word 3	Surveillance		
Surveillance device #1 time	XXX^XXXX	LSCLK	60-40
Surveillance code		LSCDE	39-31
Surveillance device #2 time	XXX^XXXX	LSCLK	30-10
Surveillance code		LSCDE	9- 1
Word 4	Communications		
Communications time		LØCLK	60-40
Communications code		LØCDE	39-31
Communications interval		INTC	30-10
Not used			9- 1
Word 5	Current order		
Skip order time		LPCT	60-49
Current order number		LTAG	48-37
Moving order mode		MWG	36-34
Moving order altitude		MWI	33-31
Moving order doctrine		MWJ	30-28

JCCS continued

Description	6400 local variable	6400 bit no.
Word 5 — Current order continued		
Moving order speed	MWK	27-25
Conditional order	MWR	24-22
Conditional order	MWB	21-19
X coordinate	MWX	18-13
Y coordinate	MWY	12- 7
Kind of fire	MWF1	6- 4
Priority of fire	MWF2	3- 1
Word 6 — Location and Next Order		
Current X coordinate	IXS	60-55
Original X coordinate	na	54-49
Current Y coordinate	IYS	48-43
Original Y coordinate	na	42-37
Current altitude	IZS	36-25
Next (or last) X coordinate	IXNEW	24-19
Next (or last) Y coordinate	IYNEW	18-13
Next order number	LTAGK	12- 1

Command Unit Characteristics JCMD (7, 15, 2)

Each command unit is described in seven words, as described below.

Description	6400 local variable	6400 bit no.
Word 1 — Characteristics		
Superior HQ number	MBØSS	60-55
Number of subordinate HQ (1-8)	NSUB	54-49
Subordinate HQ #1	MYLT(1)	48-43
Subordinate HQ #2	MYLT(2)	42-37
Subordinate HQ #3	MYLT(3)	36-31
Subordinate HQ #4	MYLT(4)	30-25
Subordinate HQ #5	MYLT(5)	24-19

JCMD continued

Description	6400 local variable	6400 bit no.
Word 1 — Characteristics continued		
Subordinate HQ #6	MYLT(6)	18-13
Subordinate unit #1	MYMEN(1)	12- 7
Subordinate unit #2	MYMEN(2)	6- 1
Word 2 — Characteristics continued		
Number of weapon unit assigned with	MBUDDY	60-55
Subordinate unit #3	MYMEN(3)	54-49
Subordinate unit #4	MYMEN(4)	48-43
Subordinate unit #5	MYMEN(5)	42-37
Not used		36- 1
Word 3 — Characteristics continued		
Subordinate unit #6	MYMEN(6)	60-55
Subordinate unit #7	MYMEN(7)	54-49
Subordinate unit #8	MYMEN(8)	48-43
Unit can call artillery	LKHQ	42-37
Not used		36- 1
Word 4 — Sensors		
Sensor #1 height	ISENH1	60-55
Sensor #1 class	ISENC1	54-52
Sensor #1 type	ISENT1	51-49
Sensor #2 height	ISENH2	48-43
Sensor #2 class	ISENC2	42-40
Sensor #2 type	ISENT2	39-37
Not used		36- 1
Word 5 — Characteristics		
Not used		60-49
Enemy units known dead	JCDEAD	48- 1
Word 6 — Characteristics		
Not used		60-49
Enemy units detected to nearest square	JCDET	48- 1

JCMD continued

Description	6400 local variable	6400 bit no.
Word 7 Characteristics		
Not used		60-49
Enemy weapon units in LØS	JCLØS	48- 1

Weapon Basic Data JWEAP (3, 36)

For purposes of data storage the weapons are divided into three groups. These groups are: (1) Artillery and mortars. (2) Direct fire weapons with fragmentation ammo, and (3) Direct fire weapons with no fragmentation ammo. Each weapon requires three words to describe its basic characteristics.

Description		6400 local variable	6400 bit no.
Word 1 Basic Data			
Weapon category		MWPC	60-55
1) Arty or mortars			
2) DF w/Frag ammo			
3) DF w/o Frag ammo			
Minimum range		MINWRG	54-43
Maximum range		MAXWRG	42-28
Crew size		KREW	27-22
Flight time per grid	∧XXX	LFLT	21-10
Rounds/trigger pull		LRND1	9- 4
Neutralization weight per round		NW	3- 1
Word 2 Basic Data continued			
Aim time	X∧XXX	LAIM	60-49
S. D. Aim time	∧XX	LAIM1	48-43
Reaim time	X∧XXX	LRAIM	42-31
S. D. Reaim time	∧XX	LRAIM1	30-25
Reload time	X∧XXX	LØAD	24-13

JWEAP continued

Description		6400 local variable	6400 bit no.
Word 2	Basic Data continued		
S. D. Reload time	$_\wedge$XX	LØAD1	12- 7
Not used			6- 1
Word 3	Basic Data continued		
Reload only after impact		KLI	60
Range tie breaker		LRTIE	59
Ammo type #1 is fragmentation	(Group 2 only)	MKIL1	58
Ammo type #2 is fragmentation		MKIL2	57
Vulnerability Class #1 use Ammo #2		LKAM	56
. . .		. . .	. . .
Vulnerability Class #12 use Ammo #2			45
Category 2-3 weapons			
Weapons firing signature		LKWS	44-39
Category 1 weapons			
Direction of artillery impact area		IMPDIR	36-34
Width of artillery impact area		IMPN1	33-31
Length of artillery impact area		IMPN2	30-28
Not used			27- 1

Total Tactical Standard Deviation JTACSD (12, 28)

Twelve words are required to store the parameters of the hit probability estimator.

Description	6400 local variable	6400 bit no.
Word 1 — Category 2-3 weapons		
Total tactical S.D. 1st round zero range, Ammo #1 $\bar{P}$, $\bar{M}$	SIGA	60-51
Total tactical S. D. 1st round .707 max range, Ammo #1, $\bar{P}$, $\bar{M}$	SIGB	50-41
Total tactical S. D. 1st round max range, Ammo #1, $\bar{P}$. $\bar{M}$	SIGC	40-31
Total tactical S. D. 1st round zero range, Ammo #2, $\bar{P}$, $\bar{M}$	SIGA	30-21
Total tactical S. D. , 1st round .707 max range, Ammo #2, $\bar{P}$, $\bar{M}$	SIGB	20-11
Total tactical S. D. 1st round max range, Ammo #2, $\bar{P}$, $\bar{M}$	SIGC	10- 1
Word 2 — Category 2-3 weapons		
Total tactical S. D. 1st round zero range, Ammo #1 P, $\bar{M}$	SIGA	60-51
Total tactical S. D. 1st round .707 max range, Ammo #1, P, $\bar{M}$	SIGB	50-41
Total tactical S. D. 1st round max range, Ammo #1, P, $\bar{M}$	SIGC	40-31
Total tactical S. D. 1st round zero range, Ammo #2, P, $\bar{M}$	SIGA	30-21
Total tactical S. D. 1st round .707 max range, Ammo #2, P, $\bar{M}$	SIGB	20-11
Total tactical S. D. 1st round max range, Ammo #2, P, $\bar{M}$	SIGC	10- 1
. .		
. .		
. .		

JTACSD continued

Description	6400 local variable	6400 bit no.
Word 12 — Category 2-3 weapons		
Total tactical S. D. 2nd round/1st round miss, zero range, Ammo #1 P, M	SIGA	60-51
Total tactical S. D. 2nd round/1st round miss, .707 max range, Ammo #1 P, M	SIGB	50-41
Total tactical S. D. 2nd round/1st round miss, max range, Ammo #1, P, M	SIGC	40-31
Total tactical S. D. 2nd round/1st round miss, zero range, Ammo #2 P, M	SIGA	30-21
Total tactical S. D. 2nd round/ 1st round miss, .707 max range, Ammo #2 P, M	SIGB	20-11
Total tactical S. D. 2nd round/ 1st round miss, max range, Ammo #2 P, M	SIGC	10- 1

Kill Probability Non-Fragmentation Ammunition JPKILL (2, 2, 28)

Four words are required to store the kill probabilities of each vulnerability class to each ammo type.

Word 1 — Weapon #9		
Kill probability vulnerability Class 1, Ammo 1	LPKH	60-55
Kill probability vulnerability Class 2, Ammo 1	LPKH	54-49
Kill probability vulnerability Class 3, Ammo 1	LPKH	48-43
Kill probability vulnerability Class 4, Ammo 1	LPKH	42-37
Kill probability vulnerability Class 5, Ammo 1	LPKH	36-31
Kill probability vulnerability Class 6, Ammo 1	LPKH	30-25
Not used		24- 1
Word 2 — Weapon #9 continued		
Kill probability vulnerability Class 1, Ammo 2	LPKH	60-55
Kill probability vulnerability Class 2, Ammo 2	LPKH	54-49
Kill probability vulnerability Class 3, Ammo 2	LPKH	48-43
Kill probability vulnerability Class 4, Ammo 2	LPKH	42-37
Kill probability vulnerability Class 5, Ammo 2	LPKH	36-31
Kill probability vulnerability Class 6, Ammo 2	LPKH	30-25
Not used		24- 1

JPKILL continued

Description	6400 local variable	6400 bit no.
Word 3 — Weapon #9 continued		
Kill probability vulnerability Class 7, Ammo 1	LPKH	60-55
. . .	. . .	. . .
12		
Word 4 — Weapon #9 continued		
Kill probability vulnerability Class 7, Ammo 2	LPKH	60-55
Kill probability vulnerability Class 8, Ammo 2	LPKH	54-49
Kill probability vulnerability Class 9, Ammo 2	LPKH	48-43
Kill probability vulnerability Class 10, Ammo 2	LPKH	42-37
Kill probability vulnerability Class 11, Ammo 2	LPKH	36-31
Kill probability vulnerability Class 12, Ammo 2	LPKH	30-25
Not used		24- 1
. . .		
Word 112, — Weapon 36 continued		
Kill probability vulnerability Class 7, Ammo 2	LPKH	60-55
. . .		
Kill probability vulnerability Class 12, Ammo 2	LPKH	30-25
Not used		24- 1

Kill Probability Fragmentation Ammunition JFRAG (2, 18)

Two words per weapon are required to store the probability of kill (given a hit) of infantry by fragmentation weapons.

Word 1 — Weapon 1		
Kill probability, Ammo 1, Net Cover 1 Fire Response 1, 2, or 3	LPKIH	60-55
Kill probability, Ammo 1, Net Cover 2 Fire Response 1, 2, or 3	LPKIH	54-49

JFRAG continued

Description	6400 local variable	6400 bit no.
Word 1 — Weapon 1 continued		
Kill probability, Ammo 1, Net Cover 3 Fire Response 1, 2, or 3	LPKIH	48-43
Kill probability, Ammo 1, Net Cover 1 Fire Response 4	LPKIH	42-37
Kill probability, Ammo 1, Net Cover 2 Fire Response 4	LPKIH	36-31
Kill probability, Ammo 1, Net Cover 3 Fire Response 4	LPKIH	30-25
Not used		24- 1
Word 2 — Weapon 1 continued		
Kill probability, Ammo 2, Net Cover 1 Fire Response 1, 2, or 3	LPKIH	60-55
Kill probability, Ammo 2, Net Cover 2 Fire Response 1, 2, or 3	LPKIH	54-49
Kill probability, Ammo 2, Net Cover 3 Fire Response 1, 2, or 3	LPKIH	48-43
Kill probability, Ammo 2, Net Cover 1 Fire Response 4	LPKIH	42-37
Kill probability, Ammo 2, Net Cover 2 Fire Response 4	LPKIH	36-31
Kill probability, Ammo 2, Net Cover 3 Fire Response 4	LPKIH	30-25
Not used		24- 1
⋮		
Word 36 — Weapon 18 continued		
Kill probability, Ammo 2, Net Cover 1	LPKIH	60-55
⋮		
Kill probability, Ammo 2, Net Cover 3	LPKIH	30-25
Not used		24- 1

Target Detection Data JDTECT (31, 6, 6)

Thirty-one words are used to store the detection data for each sensor class and sensor type. One word contains the sensor's basic data and two words contain the solid angle thresholds. Twenty-six words contain the probability of detection of dead and nonfiring targets. Two words contain the probability of detecting firing targets.

Description		6400 local variable	6400 bit no.
Word 1	Basic Data		
Scan time	$X_\wedge XXXX$	ISCAN	60-46
Minimum sensor range nonfiring targets		MINSRG	45-33
Maximum sensor range nonfiring targets		MAXRG	32-20
Maximum sensor range firing targets		MAXRF	19- 7
Probability of loss of nearest square info target out of line of sight		LTI	6- 1
Word 2	Solid Angle Thresholds Nonfiring Targets		
Smallest solid angle G1		LKGT1	60-41
Intermediate solid angle G2		LKGT2	40-21
Largest solid angle G3		LKGT3	20- 1
Word 3	Detection of Dead Targets		
$SA < G1, \overline{M}, \overline{P}$		LPDC	60-55
$G1 \le SA < G2, \overline{M}, \overline{P}$		LPDC	54-49
$G2 \le SA < G3, \overline{M}, \overline{P}$		LPDC	48-43
$SA \ge G3, \overline{M}, \overline{P}$		LPDC	42-37
$SA < G1, \overline{M}, P$		LPDC	36-31
$G1 \le SA < G2, \overline{M}, P$		LPDC	30-25
$G2 \le SA < G3, \overline{M}, P$		LPDC	24-19
$SA \ge G3, \overline{M}, P$		LPDC	18-13
Not used			12- 1
Word 4	Detection of Dead Targets continued		
$SA < G1, M, \overline{P}$		LPDC	60-55
$G1 \le SA < G2, M, \overline{P}$		LPDC	54-49

Description		6400 local variable	6400 bit no.
Word 4 Detection of Dead Targets continued			
G2 ≤ SA < G3, M, $\overline{P}$		LPDC	48-43
SA ≥ G3, M, $\overline{P}$		LPDC	42-37
SA < G1, M, P		LPDC	36-31
G1 ≤ SA < G2, M, P		LPDC	30-25
G2 ≤ SA < G3, M, P		LPDC	24-19
SA ≥ G3, M, P		LPDC	18-13
Not used			12- 1
Words 5 and 6 Detection Probabilities Nonfiring Targets			
See Words 3 and 4 for format		LP12	
. . .			
Words 27 and 28 Detection Probabilities Nonfiring Targets			
See Words 3 and 4 for format			
Word 29 Solid Angle Thresholds Firing Targets			
Smallest solid angle G1	≥ 3XX$_\wedge$XXXX	KSA1	60-41
Intermediate solid angle G2		KSA2	40-21
Largest solid angle G3		KSA3	20- 1
Word 30 Detection Probabilities Firing Targets			
SA < G1, P		KDP13	60-55
G1 ≤ SA < G2, P		KDP13	54-49
G2 ≤ SA ≤ G3, P		KDP13	48-43
SA ≥ G3, P		KDP13	42-37
SA < G1, $\overline{P}$		KDP13	36-31
G1 ≤ SA < G2, $\overline{P}$		KDP13	30-25
G2 ≤ SA < G3, $\overline{P}$		KDP13	24-19
SA ≥ G3, $\overline{P}$		KDP13	18-13
Not used			12- 1

JDTECT continued

Description	6400 local variable	6400 bit no.
Word 31 Detection Probabilities Firing Targets		
SA < G1, P	KDP34	60-55
G1 ≤ SA < G2, P	KDP34	54-49
G2 ≤ SA < G3, P	KDP34	48-43
SA ≥ G3, P	KDP34	42-37
SA < G1, $\overline{P}$	KDP34	36-31
G1 ≤ SA < G2, $\overline{P}$	KDP34	30-25
G2 ≤ SA < G3, $\overline{P}$	KDP34	24-19
SA ≥ G3, $\overline{P}$	KDP34	18-13
Not used		12- 1

Cover and Concealment Conversion JCNVRT (6, 6)

Six words per element size are required to convert the cover and concealment values of the terrain to element radii for hit probability and detection calculations.

Word 1 Concealment Conversion		
Apparent radius (X.X) concealment Index 1	LCØN1	60-55
Apparent radius (X.X) concealment Index 2	LCØN1	54-49
Apparent radius (X.X) concealment Index 3	LCØN1	48-43
Apparent radius (X.X) concealment Index 4	LCØN1	42-37
Apparent radius (X.X) concealment Index 5	LCØN1	36-31
Apparent radius (X.X) concealment Index 6	LCØN1	30-25
Apparent radius (X.X) concealment Index 7	LCØN1	24-19
Apparent radius (X.X) concealment Index 8	LCØN1	18-13
Not used		12- 1
Word 2 Concealment Conversion continued		
Apparent radius (X.X) concealment Index 9	LCØN1	60-55
Apparent radius (X.X) concealment Index 10	LCØN1	54-49
Apparent radius (X.X) concealment Index 11	LCØN1	48-43
Apparent radius (X.X) concealment Index 12	LCØN1	42-37

JCNVRT continued

Description		6400 local variable	6400 bit no.
Word 2	Concealment Conversion continued		
Apparent radius (X.X) concealment Index 13		LCØN1	36-31
Apparent radius (X.X) concealment Index 14		LØON1	30-25
Apparent radius (X.X) concealment Index 15		LCØN1	24-19
Not used			18- 1
Word 3	Cover 1 Conversion		
Apparent radius (X.X) Cover Index 1		LCØV1	60-55
⋮ ⋮		⋮	⋮
Word 4	Cover 1 Conversion continued		
Apparent radius (X.X) Cover Index 9		LCØV1	60-55
⋮ ⋮		⋮	⋮
Word 5	Cover 2 Conversion		
Net cover (1, 1, 3) Cover Index 1		LCØV2	60-55
⋮ ⋮		⋮	⋮
Word 6	Cover 2 Conversion continued		
Net cover (1, 2, 3) Cover Index 9		LCØV2	60-55
⋮ ⋮		⋮	⋮

Ground Mobility Data JGMØB (11, 5)

Eleven words per ground mobility class are required. One word contains the dismount time (mount time in the case of infantry) and the slope thresholds. Ten words are required to give the minimum moving times for the slope classes and trafficability.

Description	6400 local variable	6400 bit no.
Word 1 — Time and Slope Thresholds		
Dismount (mount) time	LDMTIM	60-41
Slope threshold M1	LSLØP(1)	40-31
Slope threshold M2	LSLØP(2)	30-21
Slope threshold M3	LSLØP(3)	20-11
Not used		10- 1
Word 2 — Minimum Moving Times (H=1)		
Negligible Slope, $\lvert \Delta E \rvert < M1$		
No road, T1	LMMTG	60-41
No road, T2	LMMTG	40-21
No road, T3	LMMTG	20- 1
Word 3 — Minimum Moving Times (H=1) continued		
Negligible Slope, $\lvert \Delta E \rvert < M1$		
Road, R1	LMMTG	60-41
Road, R2	LMMTG	40-21
Road, R3	LMMTG	20- 1
Word 4 — Minimum Moving Times (H=2)		
Moderate downhill slope, $-M2 < \Delta E < -M1$		
See Word 2 for format	LMMTG	
⋮	⋮	
Word 8 — Minimum Moving Times (H=4)		
Moderate uphill slope, $M1 < \Delta E < M2$		
See Word 2 for format		
⋮	⋮	

JGMØB continued

Description	6400 local variable	6400 bit no.
Word 11 Minimum Moving Times (H=5) continued		
Steep uphill slope, M2 < Δ E < M3		
See Word 3 for format	LMMTG	

Air Mobility Data JAMØB (5, 3)

Five words per air mobility class are required. One word contains five of the six altitude changes (in vertical feet per grid square) that an air mobility class can make. Word two contains the sixth altitude change, the attack speed index, and the first two of the five minimum moving times for an altitude change in a slope class. Word three contains the remaining three minimum moving times. Word four contains the standard altitude increment, the maximum altitude, the altitude above ground for contour flight, and the altitude for level flight. Word five contains the vertical descent time, the vertical climb time, and the dismount time.

Description		6400 local variable	6400 bit no.
Word 1 Altitude change thresholds			
Steep descent threshold, ft/grid		LACTT (1)	60-49
Moderate descent threshold, ft/grid		LACTT (2)	48-37
Negligible descent threshold, ft/grid		LACTT (3)	36-25
Negligible climb threshold, ft/grid		LACTT (4)	24-13
Moderate climb threshold, ft/grid		LACTT (5)	12- 1
Word 2 Miscellaneous Overflow			
Steep climb threshold, ft/grid		LACTT (6)	60-49
Attack speed index		KASPD	48-43
Steep descent, ft/grid	3XX‸XXXX	LMMTA (1)	42-22
Moderate descent, ft/grid	3XX‸XXXX	LMMTA (2)	21- 1

JAMØB continued

Description		6400 local variable	6400 bit no.
Word 3 — Minimum Moving Times			
Negligible change	3XX‸XXXX	LMMTA (3)	60-41
Moderate climb, ft/grid	3XX‸XXXX	LMMTA (4)	40-21
Steep climb, ft/grid	3XX‸XXXX	LMMTA (5)	20- 1
Word 4 — Altitude and Speed			
Standard altitude increment		LDELAS	60-46
Maximum altitude		KHI	45-31
Altitude above ground (contour)		LITA	30-16
Altitude level flight		LARGA	15- 1
Word 5 — Special Times			
Vertical descent time	3XX‸XXXX	INCTDN	60-40
Vertical climb time	3XX‸XXXX	INCTUP	39-19
Dismount time	3XX‸XXXX	KDMTIM	18- 1

Visual Devices JVISA (6, 2)

Six words are used to store the common logarithm of the critical visual angle for 31 values of log target-background contrast (-1.50 to 0.00) in increments of .05 for each of two devices for the given light level of the treatment. Device #1 is unaided; device #2 is 7x50 binoculars.

Unaided Eye

Description		6400 bit no.
Word 1		
Log angle for log contrast	-1.50	60-52
Log angle for log contrast	-1.45	51-43
Log angle for log contrast	-1.40	42-34
Log angle for log contrast	-1.35	33-25
Log angle for log contrast	-1.30	24-16
Log angle for log contrast	-1.25	15- 7
Not used		6- 1

JVISA continued

Description		6400 bit no.
Word 2		
Log angle for log contrast	-1.20	60-52
Log angle for log contrast	-1.15	51-43
Log angle for log contrast	-1.10	42-34
Log angle for log contrast	-1.05	33-25
Log angle for log contrast	-1.00	24-16
Log angle for log contrast	--.95	15- 7
Not used		6- 1
Word 3		
. . .		
Word 4		
. . .		
Word 5		
Log angle for log contrast	-0.30	60-52
Log angle for log contrast	-0.25	51-43
Log angle for log contrast	-0.20	42-34
Log angle for log contrast	-0.15	33-25
Log angle for log contrast	-0.10	24-16
Log angle for log contrast	-0.05	15- 7
Not used		6- 1
Word 6		
Log angle for log contrast	0.00	60-52
Not used		51- 1

Minimum Target Dimension JDIM (3)

Three words are used to store the minimum target dimension for the 16 target classes.

Description		6400 Bit no.
Word 1		
Minimum target dimension Target Class 1	XX$_{\wedge}$X	60-52
Minimum target dimension Target Class 2	XX$_{\wedge}$X	51-43
Minimum target dimension Target Class 3	XX$_{\wedge}$X	42-34
Minimum target dimension Target Class 4	XX$_{\wedge}$X	33-25
Minimum target dimension Target Class 5	XX$_{\wedge}$X	24-16
Minimum target dimension Target Class 6	XX$_{\wedge}$X	15- 7
Not used		6- 1
Word 2		
Minimum target dimension Target Class 7		60-52
Minimum target dimension Target Class 8		51-43
Minimum target dimension Target Class 9		42-34
Minimum target dimension Target Class 10		33-25
Minimum target dimension Target Class 11		24-16
Minimum target dimension Target Class 12		15- 7
Not used		6- 1
Word 3		
Minimum target dimension Target Class 13		60-52
Minimum target dimension Target Class 14		51-43
Minimum target dimension Target Class 15		42-34
Minimum target dimension Target Class 16		33-25
Not used		24- 1

(Note: In unpacking, retrieve 9 bits and divide by 10.0)

Computational Values (Real)

Image intensifier constant K1 CK1 (6). Six words are used to store the computed value of K1 = t x Tau x PI/4. DFNO for the 6 image intensifier devices. These are real numbers.

Image intensifier constant K2 CK2 (6). Six words are used to store the computed value of K2 = 4 x PI (resolution length)^2 for the 6 image intensifier devices. Each value for each device is stored as a real number.

Modulation transfer function EDMTF (6). Six words are used to store the modulation transfer function for the 6 image intensifier devices. Each integral approximation for each device is stored as a real number.

Image intensifier Value P2,P2 (6). Six words are used to store the value computed integral approximation P2 for the 6 image intensifier devices. Each value for each device is stored as a real number.

Background reflectance of the grid square for I.I. devices BREFM1 (6, 16). Sixteen words are used to store the background reflectance for I. I. devices for 16 background numbers of the grid squares for each of the 6 image intensifier devices. Each value for each device and each background number is stored as a real number.

Target reflectance for I. I. Devices TREFM2 (6, 16). Sixteen words are used to store the target reflectance for I. I. devices for 16 target classes for each of 6 image intensifier devices. Each value for each device and each target class is stored as a real number.

Integral of relative luminosity and night sky brightness P1 (3). Three words are used to store the computed integral approximation of night sky brightness and relative luminosity P1 for the three light levels of: 1 = starlight; 2 = moonlight, and 3 = part moon. Each value for each light level is stored as a real number.

Background reflectance of the grid square for visual devices BREFM3 (16). Sixteen words are used to store the computed approximation of background reflectance of the grid square for visual devices

for the 16 background numbers. Each value for each background number is stored as a real number.

Target reflectance for visual devices TREFM4 (16). Sixteen words are used to store the computed approximation of target reflectance for visual devices for 16 target classes. Each value for each target class is stored as a real number.

Night Sky Brightness SBK (11)

Eleven words are used to store the data of night sky brightness for the specific light level as defined in the treatment as 1 = starlight; 2 = moonlight, and 3 = partial moonlight. The measure of light level is in foot-lamberts.

Word 1

Light level for wavelength (microns) = .40

Word 2

Light level for wavelength (microns) = .45

Word 3

Light level for wavelength (microns) = .50

Word 4

Light level for wavelength (microns) = .55

Word 5

Light level for wavelength (microns) = .60

Word 6

Light level for wavelength (microns) = .65

Word 7

Light level for wavelength (microns) = .70

Word 8

Light level for wavelength (microns) = .75

SBK continued

Word 9

Light level for wavelength (microns) = .80

Word 10

Light level for wavelength (microns) = .85

Word 11

Light level for wavelength (microns) = .90

Radar Characteristics JRADAR (6)

One word is used to store the radar characteristics for each of six radars.

Description	6400 local variable	6400 bit no.
Maximum range personnel	MRPER	60-46
Maximum range vehicles	MRVEH	45-28
Threshold velocity of target	MRVEL	27-13
Not used		12- 1

Run Control Data JRUN (14)

Fourteen words contain the run control data.		6400 Word No.
Maximum battle time	KMAX	1
Maximum number of replications	NR	2
Initial random number	KN	3
Treatment data to be used	NT	4
X Coordinate for proximity termination	KX	5
Y Coordinate for proximity termination	KY	6
Distance for proximity termination	KDIS	7
Side for proximity termination	KSIDE	8
Number of units for proximity termination	KUNITS	9
Red fraction of casualties for termination	KREDFC	10
Blue fraction of casualties for termination	KBLUFC	11
Not used		12

JRUN continued

Description	6400 local variable	6400 bit no.
Last random number	KSTRN	13
Current replication number	NRP	14

IARTY (6, 15, 2) and IHELØ (6, 15, 2)

Six targets against which each command unit for each side can call artillery or helicopter support.

Special Data JDATA (17)

This is a collection of data required to run the battle model more efficiently or to be used for debug runs on the battle model.

Description		6400 local variable	6400 word no.
Value of lower infinity*	$377\ 7770_8$	INFL	1
Value of upper infinity**	$377\ 7777_8$	INFU	2
Decision cycle		KCTIME	3
Assessment Interval		KATIME	4
Neutralization Interval		INTN	5
Not used		INTU	6
Neutralization clock		ICLKN	7
Not used		ICLKU	8
Control switch for using ABUG		NSWCH	9
Time to begin printing ABUG		NOW	10
Time to stop printing ABUG		LATER	11
Not used			12
Not used			13
Not used			14
Not used			15
Not used			16
Not used			17

*INFL = 1048568_{10}
**INFU = 1048575_{10}

Conditions JCØND

One word is used to store the visible light attenuation coefficients of scattering and absorption and the radar degradation factor.

Description	Local variable	Bit no.
Scattering coefficient	$X_\wedge XXXXXXX$ SIGS (times 10^7)	60-37
Absorption coefficient	$XXX_\wedge XXXXX$ SIGA (times 10^5)	36-13
Radar degradation factor	$X_\wedge X_\wedge$	12- 1

Visual Device Magnification JDMAG

One word is used to store the magnification of six visual devices and the light level condition.

Magnification of Device 1	$XX_\wedge X$	DMAG(1)	60-52
Magnification of Device 2	$XX_\wedge X$	DMAG(2)	51-43
Magnification of Device 3	$XX_\wedge X$	DMAG(3)	42-34
Magnification of Device 4	$XX_\wedge X$	DMAG(4)	33-25
Magnification of Device 5	$XX_\wedge X$	DMAG(5)	24-16
Magnification of Device 6	$XX_\wedge X$	DMAG(6)	15- 7
Light level condition (1, 2, or 3) (1= starlight; 2 = moonlight; 3 = part moon)		KOND	6- 1

3 January 1972

RAC DISTRIBUTION LIST B

Recipients of this document are indicated by ☒

	Address code	Agency	Number of copies
		DEPARTMENT OF DEFENSE	
☐	A2	Director of Defense Research and Engineering	1
☐	A3	Assistant Secretary of Defense, (International Security Affairs)	1
☐	A9	Assistant Secretary of Defense, (Systems Analysis)	2
☐	B2	Joint Chiefs of Staff	1
☐	B4	Studies Analysis Gaming Agency	1
☐	B5	Weapons Systems Evaluation Group	1
☐	C1	Advanced Research Projects Agency	1
☐	C2	Defense Nuclear Agency	1
☐	C3	National Security Agency	1
☐	C4	Defense Communications Agency	1
* ☒	C6	Defense Documentation Center	2
☐	C9	Defense Intelligence Agency	1
☐	D1	National War College	1
☐	D2	Industrial College of the Armed Forces	1
☐	D3	Armed Forces Staff College	1
		HEADQUARTERS, DEPARTMENT OF THE ARMY	
☒	E2	Office, Under Secretary of the Army (OR)	1
☐	E4	Assistant Secretary of the Army (R&D)	1
☐	E7	Deputy Chief of Staff for Personnel	1
☐	E8	Deputy Chief of Staff for Military Operations	2
☐	E9	Deputy Chief of Staff for Logistics	1
☐	E10	Assistant Chief of Staff, Intelligence	2
☐	E11	Directorate of Military Support	1
☐	E14	Comptroller	1
** ☒	E15	The Army Library, Attn: ASDIRS	1
☐	E16	Office of the Provost Marshal General	1
☐	E18	Office of the Surgeon General	1
☐	E19	Assistant Chief of Staff for Communications-Electronics	1
☐	E22	Office of Personnel Operations	1
☒	E23	Assistant Chief of Staff for Force Development	1
☒	E27	Chief of Research and Development	10
☐	E32	Office of Reserve Components	1
☒	E33	Assistant Vice Chief of Staff	4
		ARMIES	
☐	H2	First US Army	1
☐	H3	Third US Army	1
☐	H5	Fifth US Army	1
☐	H6	Sixth US Army	1
☐	H8	Eighth US Army	1
		UNIFIED COMMANDS	
☐	L5	Commander in Chief, Alaska (CINCAL)	1
☐	L6	Commander in Chief, Pacific (CINCPAC)	1
☐	L12	Commander in Chief, Europe (CINCEUCOM)	1
☐	L16	US Strike Command, MacDill Air Force Base (CINCSTRIKE)	1
		ARMY COMMANDS (CONUS)	
☐	J11	US Army Security Agency	1
☐	L1	US Army Air Defense Command	1
☐	L61	US Continental Army Command	2
☐	M19	US Army Strategic Communications Command	1
		ARMY COMMANDS (Overseas)	
☐	L8	US Army, Alaska	1
☐	L9	US Army Forces Southern Command	1
☐	L10	US Army, Europe and Seventh Army	1

* Required IAW AR 70-11 and AR 70-31.

** Normally required; exclusion must be justified by Sponsor (AR 1-28).

RAC Distribution List B (continued) 3 January 1972

	Address code	Agency	Number of copies
☐	L11	US Army Pacific	1
☐	R11	US Army Concept Team, Vietnam	1
		ARMY MATERIEL COMMAND	
☒	L3	Hq US Army Materiel Command, Washington, D.C.	1
☐	I5	US Army Munitions Command, Edgewood Arsenal	1
☐	J4	US Army Armor and Engineer Board, Ft. Knox	1
☐	J5	US Army Field Artillery Board, Ft. Sill	1
☐	J6	US Army Aviation Test Board, Ft. Rucker	1
☐	J8	US Army Infantry Board, Ft. Benning	1
☒	M7	US Army Electronics Command, Ft. Monmouth	1
☐	M10	US Army Missile Command, Redstone Arsenal	1
☐	M13	US Army Munitions Command, Dover, N.J.	1
☐	M22	US Army Aviation Systems Command, St. Louis	1
☐	M24	US Army Weapons Command, Rock Island	1
☐	M25	US Army Mobility Equipment Command, St. Louis	1
☐	M26	Management Information Systems Directorate	1
☐	M29	USA Advanced Materiel Concepts Agency, Alexandria, Va.	1
☐	M30	US Army Army Tank-Automotive Command, Warren	1
☐	M32	US Army Test and Evaluations Command, Aberdeen Proving Ground	1
☐	R6	Dugway Proving Ground, Dugway	1
☐	R9	White Sands Missile Range, Los Cruces	1
☒	G25	Director, Army Materiel Systems Analysis Agency, Aberdeen Proving Ground	1
		COMBAT DEVELOPMENTS COMMAND	
☒	L2	Hq USA, Combat Developments Command, Ft. Belvoir	1
☐	G2	USACDC Air Defense Agency, Ft. Bliss	1
☐	G3	USACDC Armor Agency, Ft. Knox	1
☐	G4	USACDC Field Artillery Agency, Ft. Sill	1
☐	G5	USACDC Aviation Agency, Ft. Rucker	1
☐	G7	USACDC Chemical, Biological, and Radiological Agency, Ft. McClellan	1
☐	G11	USACDC Communications-Electronics Agency, Ft. Monmouth	1
☐	G12	USACDC Engineer Agency, Ft. Belvoir	1
☐	G13	USACDC Infantry Agency, Ft. Benning	1
☐	G16	USACDC Military Police Agency, Ft. Gordon	1
☐	G19	USACDC Transportation Agency, Ft. Eustis	1
☐	G20	USACDC Intelligence Agency, Ft. Huachuca	1
☐	G22	USACDC Nuclear Agency, Ft. Bliss	1
☐	G26	USACDC Special Operations Agency, Ft. Bragg	1
☐	G28	USACDC Maintenance Agency, Aberdeen Proving Ground	1
☐	L44	USACDC Concepts and Force Design Group, Alexandria	1
☐	L45	USACDC Systems Analysis Group, Ft. Belvoir	1
☒	L69	USACDC Intelligence and Control Systems Group, Ft. Belvoir	1
☐	O26	USACDC Strategic Studies Institute, Carlisle Barracks	1
☒	P2	USACDC Combat Systems Group, Ft. Leavenworth	1
☐	P3	USACDC Personnel and Logistics Systems Group, Ft. Lee	1
		SCHOOLS, US ARMY	
☐	G27	US Army Military Police, Ft. Gordon	1
☐	M17	US Army Ordnance, Aberdeen Proving Ground	1
☐	O2	US Army Air Defense, Ft. Bliss	1
☐	O3	US Army Armor, Ft. Knox	1
☐	O4	US Army Field Artillery, Ft. Sill	1
☐	O5	US Army Chemical, Ft. McClellan	1
☐	O6	US Army Engineer, Ft. Belvoir	1
☐	O7	US Army Finance, Ft. Benjamin Harrison	1
☐	O8	US Army Infantry, Ft. Benning	1
☐	O9	US Army Intelligence, Ft. Huachuca	2
☐	O10	Medical Field Service, Brooke Army Medical Center	1
☐	O11	US Army Command and General Staff College, Ft. Leavenworth	1
☐	O12	US Army Aviation, Ft. Rucker	1
☐	O16	US Army School, Europe	1
☐	O19	US Army Missile and Munitions Center and School, Redstone Arsenal	1

RAC Distribution List B (continued) 3 January 1972

	Address code	Agency	Number of copies
☐	O21	US Army Quartermaster, Ft. Lee	1
☐	O23	US Army Institute of Military Assistance, Ft. Bragg	2
☐	O24	US Army War College, Carlisle	1
☐	O25	US Army Transportation, Ft. Eustis	1
☐	O27	USMA, West Point	1
☐	O29	US Army Adjutant General, Ft. Benjamin Harrison	1
☐	O30	US Army Combat Surveillance School and Training School, Ft. Huachuca	1
☐	O31	US Army Signal Center and School, Ft. Monmouth	1
☐	O32	US Army Southeastern Signal School, Ft. Gordon	1
☐	O33	USWAC School, Ft. McClellan	1
		MISCELLANEOUS ARMY (CONUS)	
☒	E34	US Army Intelligence Threat Analysis Detachment	1
☐	E37	Logistics Doctrine, Systems and Readiness Agency, New Cumberland Army Depot	1
☐	E38	Engineer Strategic Studies Group	1
☐	K11	US Army Logistics Management Center	2
☒	P9	US Army Strategy and Tactics Analysis Group	1
☐	R4	US Army Behavioral and Systems Research Laboratory	1
		US AIR FORCE	
☐	T4	Hq, US Air Force (AF/SAMID)	1
☐	T8	Air University Library, Maxwell Field	1
		US NAVY	
☐	S1	Chief of Naval Operations, OP-96	1
☐	S2	Chief of Naval Operations, OPO3EG-CNO	1
☐	S9	Naval War College, Newport	1
		US MARINE CORPS	
☒	S23	Marine Corps Development and Education Command, Quantico, Va.	1
		US GOVERNMENT AGENCIES	
☐	U1	Central Intelligence Agency	1
☐	U6	Department of State, Foreign Affairs Research Documents Center	3
☐	U9	Department of State, Office of Science and Technology	1
		DEFENSE CONTRACTORS AND UNIVERSITIES	
☐	C216	Center for Naval Analysis	1
☐	V2	Human Resources Research Organization, Inc.	1
☐	V3	Institute for Defense Analyses	1
☐	V5	RAND Corporation	1
☐	V6	Center for Research in Social Systems	1
☐	V7	Stanford Research Institute	1
		FOREIGN GOVERNMENTS—BASIC STANDARDIZATION AGREEMENT COUNTRIES (Released through ST&A Division, OCRD)	
☐	L7	Supreme Headquarters, Allied Powers, Europe (USNMR)*	1
☐	W1	British Defense Research Staff	2
☐	W2	Canadian Defense Research Staff	2
☐	W3	North American Air Defense Command (US-Canadian HQ)	1
☐	W4	US Army Strategic Group–UK (for release to DOAE)	1
☐	W5	Australian Army Representative	2
☐	W6	US Delegation, UN Military Staff Committee	1

*Foreign Headquarters US Representative.

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)* Research Analysis Corporation McLean, Virginia 22101	**2a. REPORT SECURITY CLASSIFICATION** UNCLASSIFIED **2b. GROUP**

3. REPORT TITLE

CARMONETTE IV and CARMONETTE V

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Client Report, Aug 72 - Sep 72

5. AUTHOR(S) *(First name, middle initial, last name)*

Norman W. Parsons

6. REPORT DATE	**7a. TOTAL NO. OF PAGES**	**7b. NO. OF REFS**
October 1972	161	3

8a. CONTRACT OR GRANT NO. DAHC-19-69-C0017 **b. PROJECT NO.** 012.114 **c.** **d.**	**9a. ORIGINATOR'S REPORT NUMBER(S)** RAC-D12-CR **9b. OTHER REPORT NO(S)** *(Any other numbers that may be assigned this report)* None

10. DISTRIBUTION STATEMENT Distribution limited to U.S. Government agencies only; Test and Evaluation; 4 Aug 72. Other requests for this document must be referred to HQDA (DARD-ARG-S), Washington, D.C. 20310.

11. SUPPLEMENTARY NOTES	**12. SPONSORING MILITARY ACTIVITY**
None	Office, Chief of Research & Development, HQ Dept of Army Washington, D.C. 20310

13. ABSTRACT

This document describes the changes made in the CARMONETTE small-unit battle computer simulation since the publication of the CARMONETTE III documentation (RAC R-28).

DD FORM 1 NOV 65 1473

UNCLASSIFIED

Security Classification

UNCLASSIFIED

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Simulation						
War Game						
Small Unit Battles						
Weapon Evaluation						
Helicopter Model						
Night Vision Device Evaluation						

UNCLASSIFIED

Security Classification